



STACKS - S.B.T.

HSL No. 78-12

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~~CONFIDENTIAL~~

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**GPO:** Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **Give corporate author, title, personal author, and catalog or stock number.**

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**See publication:** Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

**SAE:** Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

**TRB:** Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

**Corporate author:** Inquiries should be addressed to the organization listed in the individual citation.

## **ABSTRACT CITATIONS**

# SAMPLE ENTRIES

## FORMAT OF ENTRIES IN HIGHWAY SAFETY LITERATURE

NHTSA accession number ----- HS-013 124  
Title of document ----- **MAXIMUM BRAKE PEDAL FORCES PRODUCED BY  
MALE AND FEMALE DRIVERS**  
Abstract ----- The object of this research was to obtain data concerning the maximum amount of brake pedal force that automobile drivers were able to sustain over a period of ten seconds. Subjects were told to apply the brakes in the test car as they would in a panic stop, and to exert as much force as possible on the pedal over the entire ten second test period. A total of 84 subjects were tested, including 42 males and 42 females. The results indicated that there is a wide distribution of values which characterizes the pedal force that the subjects were able to generate. Male subjects produced generally higher forces than did females. Over half the women tested were unable to exert more than 150 lbs. of force with either foot alone, but when both feet were applied to the pedal, force levels rose significantly.  
Personal author(s) ----- by C. R. VonBuseck  
Corporate author (or author's affiliation) ----- General Motors Corp.  
Publication date; pagination ----- 1973? ; 18p  
Supplementary note ----- Excerpts from Maximum Parking Brake Forces Applied by Male and Female Drivers (EM-23) BY R. L. Bierley, 1965, are included.  
Availability ----- Availability: Corporate author

NHTSA accession number ----- HS-018 924  
Title of document ----- **NATURAL FREQUENCIES OF THE BIAS TIRE**  
Abstract ----- The lowest natural frequencies of a bias tire under inflation pressure are deduced by assuming the bias tire as a composite structure of a bias-laminated, toroidal membrane shell and rigorously taking three displacement components into consideration. The point collocation method is used to solve a derived system of differential equations with variable coefficients. It is found that the lowest natural frequencies calculated for two kinds of bias tire agree well with the corresponding experimental results in a wide range of inflation pressures. Results of the approximate analysis show that the influences of the in-plane inertia forces on natural frequency may be considered small, but the influences of in-plane displacements are large, particularly on the natural frequency of the tire under low inflation pressure.  
Personal author(s) ----- by Masami Hirano; Takashi Akasaka  
Journal citation ----- Publ: Tire Science and Technology v4 n2 p86-114 (May 1976)  
Publication date ----- 1976; 6refs  
Availability ----- Availability: See publication



HS-023 294

## **DRIVER VISIBILITY UNDER VARYING ADVERSE WEATHER CONDITIONS**

ABRIDGED VERSIONS OF SEVERAL OF THE PAPERS PRESENTED AT A SYMPOSIUM PLANNED BY THE TRANSPORTATION RES. BOARD'S COM. ON VISIBILITY AND HELD ON 16-18 AUG 1977 IN PORTLAND, OREG. (NEAR THE OREGON DOT (DEPT. OF TRANSPORTATION) FOG RES. FACILITY), ARE PROVIDED. THE PAPERS COVER VARIOUS ASPECTS OF THE SUBJECT OF DRIVING UNDER ADVERSE VISIBILITY CONDITIONS. FOLLOWING THE ABRIDGED VERSIONS OF THE PRESENTATIONS, A SUMMARY IS PROVIDED OF A WORKSHOP WHICH WAS HELD AFTER THE SYMPOSIUM. AMONG THE POINTS DISCUSSED WERE THE FOLLOWING: NO NEED TO SPECIFY THE DEGREE OF VISIBILITY DEGRADATION AT THIS TIME BUT, RATHER, A NEED TO SPECIFY THE NATURE AND POSSIBLE COUNTERMEASURES FOR THE DEGRADATION; NEED TO MAKE DRIVERS AWARE OF THE PROBLEM THROUGH COMMUNITY INVOLVEMENT AS AN IMPORTANT ELEMENT IN ANY COUNTERMEASURE PROGRAM; NEED TO MAKE THE DRIVER MORE AWARE OF VEHICLE AND SYSTEM CAPABILITIES AND HOW THEY ARE AFFECTED UNDER DIFFERENT REDUCED VISIBILITY CONDITIONS; NON-UNIFORM BEHAVIOR AS THE MAJOR CAUSE OF ACCIDENTS IN SITUATIONS OF DEGRADED VISIBILITY; QUESTION OF WHETHER THE ADDITION OF ON-BOARD RADAR WOULD INCREASE THE ALREADY HIGH TASK LOADING ON THE DRIVER; CRITICAL NEED FOR HARD DATA TO DEFINE THE PROBLEM ACCURATELY AND TO SHOW JUST HOW MUCH IMPROVEMENT IS POSSIBLE; AND THE BASIC ISSUE THAT THE DRIVER DOES NOT RESPOND PROPERLY (E.G. REDUCING SPEED) TO REDUCED VISIBILITY CONDITIONS.

NATIONAL ACAD. OF SCIENCES, TRANSPORTATION RES. BOARD, 2101 CONSTITUTION AVE. N.W., WASHINGTON, D.C. 20418

Rept. No. TRANSPORTATION-RES-CIRC-193; 1978; 20P  
REFS

Availability: TRB

HS-023 295

## **ASSESSMENT OF VEHICLE HANDLING WHEN CROSSING TWO TYPES OF BUS LANE DELINEATOR**

THE EFFECTS ON VEHICLE HANDLING OF TWO TYPES OF BUS LANE DELINEATORS, DEVISED IN ORDER TO DISCOURAGE THE USE OF BUS LANES BY TRAFFIC OTHER THAN SCHEDULED BUSES, WERE DETERMINED AT A VARIETY OF SPEEDS AND ANGLES IN WET AND DRY CONDITIONS. ONE TYPE OF DELINEATOR CONSISTS OF A RUBBER STRIP ROUGHLY TRIANGULAR IN CROSS SECTION. THE OTHER TYPE CONSISTS OF A HOLLOW COLLAPSIBLE POST 900 MM IN HEIGHT. IT WAS FOUND THAT THE RUBBER STRIP DELINEATOR POSES SEVERE HANDLING PROBLEMS FOR TWO-WHEELED VEHICLES CROSSING THEM UNDER WET CONDITIONS AT

SMALL CROSSING ANGLES (5° OR LESS), USUALLY BY LATERAL DISPLACEMENT OF THE REAR WHEEL. LARGER VEHICLES HAD VERY LITTLE DIFFICULTY IN CROSSING THEM. PEDESTRIANS WITH WHEELED SHOPPING BASKETS MAY HAVE TROUBLE CROSSING THE RUBBER STRIPS IF THEY PUSH RATHER THAN PULL THEIR BASKETS OVER THEM. AN UNRESTRAINED CHILD IN A PUSHCHAIR MAY BE TIPPED FORWARD IF THE PUSHCHAIR'S REAR WHEELS ARE NOT LIFTED OVER THE STRIPS. THE PLASTIC POSTS HAD LITTLE OR NO EFFECT ON VEHICLE STABILITY IF HIT A GLANCING BLOW. HOWEVER, A DIRECT HIT BY A TWO-WHEELED VEHICLE CAN DISLodge THE POST AND LEAD TO LOSS OF VEHICLE CONTROL. THE POSTS CAN BE DISLODGED AT SPEEDS IN EXCESS OF 32 KM/H BY CARS OR HEAVIER VEHICLES.

by G. R. WATTS

TRANSPORT AND ROAD RES. LAB., VEHICLE SAFETY DIV., CROWTHORNE, BERKS., ENGLAND

Rept. No. TRRL-SR-282; 1977; 15P IREF

Availability: CORPORATE AUTHOR

HS-023 296

## **THE USE OF RUMBLE AREAS TO ALERT DRIVERS**

FIRST, LABORATORY STUDIES USING A VEHICLE SIMULATOR WERE EMPLOYED TO ESTABLISH THE ALERTING PROPERTIES OF DIFFERENT PATTERNS OF RUMBLE NOISE. VOLUNTEERS USING THE SIMULATOR WERE ASKED TO ASSESS THE RELATIVE NOTICEABILITY OF THE DIFFERENT PATTERNS OF LOUDER NOISE ADDED TO ITS NORMAL SOUNDTRACK OF ROAD NOISE. THESE STUDIES SHOWED THAT A HALF-SECOND PULSE OF NOISE EVERY SECOND GAVE SUBJECTS THE MOST SATISFACTORY AUDIBLE ALERT; THUS THE RUMBLE AREAS WERE DESIGNED TO GIVE THIS PATTERN OF NOISE TO THOSE VEHICLES THAT WERE TRAVELING AT THE 85TH PERCENTILE SPEED BEFORE THE RUMBLE AREAS WERE LAID. INITIAL WORK ON RUMBLE AREAS ALSO INVOLVED THE DEVELOPMENT OF A ROAD SURFACE THAT WOULD PRODUCE AN ADEQUATE INCREASE IN NOISE LEVELS IN VEHICLES. STUDIES SHOWED THAT AN INCREASE IN NOISE LEVEL OF APPROXIMATELY 10 DB(A) CAN BE OBTAINED BY USING 13-19 MM ROADSTONE SET ONTO THE ROAD SURFACE USING EPOXY RESIN. A PILOT FIELD STUDY AT THREE SITES RECORDED APPROACH SPEEDS TO THE HAZARDS BEFORE AND AFTER THE INSTALLATION OF THE RUMBLE AREAS AND THEN COMPARED MEAN SPEEDS AND SPEED DISTRIBUTIONS. THE RESULTS SHOWED SMALL BUT STATISTICALLY SIGNIFICANT REDUCTIONS IN MEAN SPEEDS AND DOWNWARD SHIFTS OF THE SPEED DISTRIBUTIONS, WHICH CHANGES WERE THOUGHT SUFFICIENTLY ENCOURAGING TO WARRANT A MORE DETAILED INVESTIGATION. THUS, A FURTHER FIELD STUDY AT TEN DIFFERENT SITES THROUGHOUT GREAT BRITAIN CHOSEN PRIMARILY TO INCLUDE AN ASSORTMENT OF ROAD TYPES AND HAZARD SITUATIONS, WAS CONDUCTED. THIS STUDY SHOWED THAT RUMBLE AREAS HAD NO

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CONSISTENT EFFECT ON DRIVERS' SPEEDS, BUT THAT THEY MAY HAVE BEEN INSTRUMENTAL IN REDUCING THE NUMBER OF ACCIDENTS. APPENDICES CONTAIN A PLAN OF A RUMBLE AREA SITE, CALCULATIONS OF ITS DIMENSIONS, AND SPECIFICATIONS AND LAYING INSTRUCTIONS. THE RUMBLE AREA QUESTIONNAIRE IS ALSO INCLUDED.

by R. SUMNER; J. SHIPPEY  
TRANSPORT AND ROAD RES. LAB., ROAD USER  
CHARACTERISTICS DIV., CROWTHORNE, BERKS.,  
ENGLAND  
Rept. No. TRRL-LR-800; 1977; 33P 6REFS  
Availability: CORPORATE AUTHOR

HS-023 297

### **TRENDS IN MOTORCYCLE OWNERSHIP AND USE**

A STUDY MADE OF LEVELS OF MOTORCYCLE OWNERSHIP AND USE IN GREAT BRITAIN AND OTHER COUNTRIES IN ORDER TO DETECT ANY POSSIBLE FUTURE TRENDS SHOWS THAT THE NUMBER OF MOTORCYCLES REACHED A PEAK IN BRITAIN IN 1960, AND THAT THERE WAS THEN A STEEP DECLINE UNTIL 1972, FROM WHICH TIME THERE HAS BEEN A SHARP INCREASE. THE PRECISE REASONS FOR THE REVERSAL OF THE TREND HAVE NOT BEEN CLEARLY ESTABLISHED. THE TRENDS HAVE BEEN SIMILAR IN DIFFERENT PARTS OF BRITAIN, ALTHOUGH THE LEVELS ARE INFLUENCED BY CLIMATE AND POPULATION DENSITY. THERE ARE WIDE VARIATIONS IN MOTORCYCLE OWNERSHIP AMONG DIFFERENT COUNTRIES (AUSTRIA, BELGIUM, DENMARK, FINLAND, FRANCE, WEST GERMANY, GREAT BRITAIN, IRELAND, ITALY, NETHERLANDS, NORWAY, SPAIN, SWITZERLAND, CANADA, UNITED STATES, JAPAN, AUSTRALIA, NEW ZEALAND), AND THESE ARE NOT EXPLAINABLE SOLELY IN TERMS OF INCOME LEVELS AND CAR OWNERSHIP LEVELS. IN ALL COUNTRIES WITH HIGH LEVELS OF MOTORCYCLE OWNERSHIP, A HIGH PROPORTION OF THE VEHICLES ARE MOPEDS; AND THERE IS A TENDENCY FOR SUCH COUNTRIES TO REQUIRE NEITHER MOPEDS NOR THEIR RIDERS TO BE LICENSED AND TO HAVE A LOW MINIMUM AGE FOR MOPED RIDERS. LIKELY FUTURE TRENDS IN CAR OWNERSHIP AND INCOME LEVELS IN BRITAIN DO NOT INDICATE ANY CLEAR FUTURE TRENDS IN LEVELS OF MOTORCYCLING. FUTURE LEVELS MIGHT, HOWEVER, BE INFLUENCED STRONGLY BY ANY SUBSTANTIAL DEPARTURE FROM THE LEGISLATIVE FRAMEWORK FOR MOTORCYCLE, AND MORE ESPECIALLY MOPED, OWNERSHIP, AND USE.

by J. C. TANNER  
TRANSPORT AND ROAD RES. LAB., ACCESS AND  
MOBILITY DIV., CROWTHORNE, BERKS., ENGLAND  
Rept. No. TRRL-SR-361; 1977; 30P 13REFS  
Availability: CORPORATE AUTHOR

HS-023 298

### **STATE OF NEW JERSEY 1976 ACCIDENT DATA, TRAFFIC VOLUMES AND MILEAGE ON THE**

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### **STATE HIGHWAY SYSTEM BY ROUTE, COUNTY AND MUNICIPALITY**

STATISTICAL TABLES PROVIDE ACCIDENT DATA, TRAFFIC VOLUMES, AND MILEAGE ON THE NEW JERSEY STATE HIGHWAY SYSTEM DURING 1976 ACCORDING TO ROUTE, COUNTY, AND MUNICIPALITY. A TABULAR SUMMARY OF HIGHWAY ACCIDENT STATISTICS BY NUMBER OF LANES AND DAILY TRAFFIC VOLUMES SHOWS THE NUMBER AND RATES (PER 100 MVM (MILLION VEHICLE MILES)) OF ACCIDENTS, INJURY ACCIDENTS, FATAL ACCIDENTS, INJURIES, AND FATALITIES.

NEW JERSEY DEPT. OF TRANSPORTATION, 1035  
PARKWAY AVE., TRENTON, N.J. 08625  
1978; 55P  
Availability: CORPORATE AUTHOR

HS-023 299

### **THE UNIFORM TIRE QUALITY GRADING SYSTEM: A CASE STUDY OF THE GOVERNMENT REGULATORY PROCESS**

THE COMPLEX INTERACTIONS OF GOVERNMENT, INDUSTRY, PUBLIC INTEREST GROUPS, CONSUMERS, AND THE LEGAL SYSTEM IN RESOLVING THE ISSUE OF AUTOMOBILE TIRE QUALITY GRADING ARE TRACED IN ORDER TO ILLUMINATE THE CRITICAL DECISION POINTS THAT OCCUR THROUGHOUT THE U.S. REGULATORY SYSTEM AND THEREBY ASSIST THE NATION IN DEVISING IMPROVED METHODS OF PROBLEM SOLVING. THE ISSUE OF TIRE QUALITY GRADING WAS CHOSEN FOR STUDY BECAUSE IT REPRESENTED AN APPARENT FAILURE OF THE REGULATORY MECHANISM TO RESOLVE THE PROBLEMS PRESENTED TO IT. THE ATTEMPT BY THE FEDERAL GOVERNMENT TO HELP THE AMERICAN CONSUMER TO BUY TIRES MORE INTELLIGENTLY BEGAN IN JAN 1964 WHEN THE SENATE SUBCOMMITTEE ON RETAILING, DISTRIBUTION, AND MARKETING PRACTICES RECOMMENDED A SYSTEM WHEREBY TIRES ARE RATED ACCORDING TO GOVERNMENT STANDARDS OF SAFETY, ENDURANCE, GENERAL QUALITY, AND CONSTRUCTION. DESPITE ENACTMENT OF THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT IN 1966, WHICH REQUIRED THAT A TIRE QUALITY GRADING SYSTEM GO INTO EFFECT NO LATER THAN 9 SEP 1969, THERE IS TODAY STILL NO SUCH SYSTEM. MILLIONS OF DOLLARS HAVE BEEN EXPENDED BY THE GOVERNMENT AND THE PRIVATE CORPORATIONS, AND TO NO AVAIL. SOME CONCLUSIONS ARE DRAWN ABOUT THE GOVERNMENT REGULATORY PROCESS FROM THE HISTORY OF TIRE QUALITY GRADINGS. FIRST, A GREAT DEAL OF INFORMATION ON THE COSTS, UTILITY, AND EFFECTS OF TIRE QUALITY STANDARDS SHOULD HAVE BEEN GATHERED BEFORE LEGISLATING THE QUALITY GRADING PROVISION. SECOND, AT NO POINT IN THE PROCESS, AS FAR AS IS KNOWN, WERE ANY STUDIES DONE OF THE CONSUMER TIRE PURCHASE DECISION, THE INFORMATION CONSUMERS WANT TO HELP MAKE THAT DECISION (EXCEPT FOR SOME GENERAL STUDIES SHOWING CONCERN WITH SAFETY AND TREADWEAR), OR WHAT CONSUMERS

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THOUGHT IT MIGHT BE WORTH TO HAVE THAT INFORMATION. THIRD, THERE APPEARS TO HAVE BEEN LITTLE ANALYSIS OF THE COSTS, BENEFITS, AND EFFECTS OF TIRE QUALITY GRADING STANDARDS THROUGHOUT THE PROCESS. FOURTH, NEITHER CONGRESS NOR THE EXECUTIVE BRANCH FOLLOWED UP TO ENSURE THAT THE STANDARDS WERE IMPLEMENTED ON A TIMELY BASIS. FIFTH, THERE APPEARED TO BE NO SIMPLE, FACE-SAVING WAY TO REVIEW THE LEGISLATIVE REQUIREMENT AND PROPOSE THAT IT BE ELIMINATED OR REVISED, AFTER IT WAS FELT THAT THE NEED FOR QUALITY GRADING HAD MORE OR LESS EVAPORATED. FINALLY, SOME ORGANIZED FORMAT OR FRAMEWORK FOR INDUSTRY PARTICIPATION MIGHT HAVE BEEN VERY USEFUL IN THE DEVELOPMENT AND EXPEDITIOUS IMPLEMENTATION OF THE TIRE QUALITY STANDARD.

NATIONAL CENTER FOR PRODUCTIVITY AND QUALITY OF WORKING LIFE, WASHINGTON, D.C. 20036

1978; 82P REFS

Availability: CORPORATE AUTHOR

HS-023 300

#### **MINIMUM REQUIREMENTS FOR BRAKE COMPONENT WEAR WARNING, APPROVED JULY 1975, AMENDED JULY 1977**

THE PURPOSE OF THIS REGULATION IS TO REQUIRE VEHICLES MANUFACTURED FOR SALE ON OR AFTER THE EFFECTIVE DATE OF THIS REGULATION, TO BE EQUIPPED WITH A DIRECT AND EFFECTIVE MEANS OF DETERMINING WHEN THE DISCARD POINT OF THE SERVICE BRAKE FRICTION MATERIALS HAVE BEEN REACHED, WITHOUT REQUIRING THE REMOVAL OF MAJOR COMPONENTS, SUCH AS WHEELS, HUBS, DRUMS, OR ANY STRUCTURAL MEMBERS OF THE VEHICLE, AND TO REQUIRE EACH BRAKE DRUM OR ROTOR TO BE MARKED TO SHOW THE DISCARD POINT. THE SERVICE BRAKING SYSTEM SHALL BE CONSTRUCTED SO THAT A VISIBLE, AUDIBLE, OR TACTILE SIGNAL (AS DEFINED IN THE REGULATION) WILL BE GIVEN WHEN ANY SERVICE BRAKE FRICTION MATERIAL HAS BEEN WORN TO ITS DISCARD POINT. THE SCOPE OF THIS REGULATION SHALL INCLUDE THE SERVICE BRAKE FRICTION MATERIALS, DRUMS, AND ROTORS ON ALL PASSENGER CARS, MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, AND BUSES, DESIGNED FOR HIGHWAY USE, WITH A GROSS VEHICLE WEIGHT OF 10,000 POUNDS OR LESS.

VEHICLE EQUIPMENT SAFETY COMMISSION, 1030 15TH ST. N.W., SUITE 908, WASHINGTON, D.C. 20005  
Rept. No. VESC-14; 1977; 6P

Availability: CORPORATE AUTHOR

HS-023 301

#### **MINIMUM REQUIREMENTS FOR THE DESIGN OF A VEHICLE IDENTIFICATION NUMBER SYSTEM**

#### **FOR PASSENGER CARS, APPROVED AUGUST 1975, AMENDED JULY 1977**

THE PURPOSE OF THIS REGULATION IS TO PROVIDE THE STATES WITH A UNIFORM MINIMUM REQUIREMENT FOR THE DESIGN OF A PASSENGER CAR VEHICLE IDENTIFICATION NUMBER (VIN) SYSTEM, IN COMPLIANCE WITH FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) 115. IT IS DESIGNED TO PROVIDE A UNIQUE PASSENGER CAR IDENTIFIER FOR THE INTERESTS OF HIGHWAY SAFETY, MOTOR VEHICLE REGISTRATION, AND LAW ENFORCEMENT UTILIZATION. THE SCOPE OF THIS REGULATION IS PRIMARILY DIRECTED TO ESTABLISH THE MINIMUM IDENTIFICATION ELEMENTS, CODIFICATION CRITERIA, AND THE SEQUENCE OF THE IDENTIFICATION ELEMENTS CONTAINED IN A PASSENGER CAR VIN SYSTEM. THE CONTENT, STRUCTURE, LENGTH, AND CODING OF THE VIN'S VEHICLE DESCRIPTOR SECTION (VDS) AND VEHICLE INDICATOR SECTION (VIS) ARE SPECIFIED.

VEHICLE EQUIPMENT SAFETY COMMISSION, 1030 15TH ST. N.W., SUITE 908, WASHINGTON, D.C. 20005  
Rept. No. VESC-15; 1977; 12P

Availability: CORPORATE AUTHOR

HS-023 302

#### **MINIMUM REQUIREMENTS FOR MOTOR VEHICLE CONNECTING DEVICES AND TOWING METHODS, ADOPTED JULY 1968, REVISED MARCH 1973, REVISED JULY 1977**

THE PURPOSE OF THIS REGULATION IS TO PROVIDE THE STATES WITH A UNIFORM MINIMUM REQUIREMENT FOR MOTOR VEHICLE CONNECTING DEVICES AND TOWING METHODS. IT IS DESIGNED TO INCREASE HIGHWAY SAFETY BY REDUCING TOWING-RELATED AND HITCH-RELATED ACCIDENTS. IT COVERS THE FOLLOWING AREAS: COUPLINGS, HITCHES, SAFETY CHAINS AND ATTACHING MEANS REQUIRED, IDENTIFICATION, INSTALLATION, MAINTENANCE, COMPLIANCE, AND CERTIFICATION AND/OR TESTING. SUBJECT TO SECTION 11.1, ON AND AFTER THE EFFECTIVE DATE(S) OF THIS REGULATION, EVERY TRAILER AND SEMITRAILER, HAVING A MAXIMUM OF GROSS VEHICLE WEIGHT OF 10,000 POUNDS OR LESS, WHILE BEING DRAWN UPON THE PUBLIC HIGHWAYS OF A STATE, SHALL BE ATTACHED TO THE VEHICLE DRAWING THE SAME BY A DEVICE OF A TYPE APPROVED BY THE COMMISSIONER.

VEHICLE EQUIPMENT SAFETY COMMISSION, 1030 15TH ST. N.W., SUITE 908, WASHINGTON, D.C. 20005  
Rept. No. VESC-V-5; 1977; 29P

Availability: CORPORATE AUTHOR

HS-023 303

#### **TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS**

THIS COMPILATION OF PAPERS CONCERNING TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS COVERS THE FOLLOWING TOPICS: IN-

DIANA TRAFFIC-ACCIDENT RECORD SYSTEM (INTRACS); SAMPLING PROCEDURE USING MULTISTATE TRAFFIC RECORDS TO SELECT ACCIDENT AND EXPOSURE DATA-COLLECTION SITES; FILTERING OF FATAL ACCIDENT RATES; ANALYSIS OF COUNTYWIDE ACCIDENT DATA BY RATE AND FREQUENCY; EFFECTIVENESS OF SELECTIVE ENFORCEMENT IN REDUCING ACCIDENTS IN METROPOLITAN TORONTO, CANADA; EFFECTS OF THE 88.5 KM/H (55 MPH) SPEED LIMIT AND ITS ENFORCEMENT ON TRAFFIC SPEEDS AND ACCIDENTS; RELATIONSHIP OF THE COLOR OF THE HIGHWAY CENTERLINE STRIPE TO THE ACCIDENT RATE IN ARIZONA; DIAL-IN FREEWAY-TRAFFIC INFORMATION SYSTEM; BULB-LOSS EFFECTS ON MESSAGE READABILITY OF MOTORIST-INFORMATION MATRIX SIGNS; SURVEY OF MOTORIST ROUTE SELECTION CRITERIA; AND MOTORIST-AID SYSTEM ON AN ILLINOIS RURAL FREEWAY.

by FRANCES R. ZWANZIG, ED.  
NATIONAL ACAD. OF SCIENCES, TRANSPORTATION RES. BOARD, 2101 CONSTITUTION AVE. N.W., WASHINGTON, D.C. 20418  
Rept. No. TRR-643; 1977; 60P REFS  
INCLUDES HS-023 304--HS-023 314. PREPARED FOR PRESENTATION AT 56TH ANNUAL MEETING OF TRANSPORTATION RES. BOARD.  
Availability: TRB \$3.60

HS-023 304

#### INDIANA TRAFFIC-ACCIDENT RECORD SYSTEM (INTRACS)

THE INDIANA TRAFFIC-ACCIDENT RECORD SYSTEM (INTRACS) REPRESENTS A MAJOR STATEWIDE EFFORT AND IS BEING DEVELOPED TO LOCATE ACCIDENTS ON ROAD SEGMENTS ANYWHERE IN THE STATE. THIS SYSTEM IS BEING DEVELOPED FOR THE INDIANA DEPT. OF TRAFFIC SAFETY AND VEHICLE INSPECTION, IN COOPERATION WITH THE INDIANA STATE HWY. COMMISSION, THE INDIANA STATE POLICE, THE INDIANA DEPT. OF ADMINISTRATION, AND THE U.S. DEPT. OF TRANSPORTATION. WHEN COMPLETED, THE SYSTEM WILL PROVIDE A PROCEDURE FOR ANALYZING ACCIDENT RATES AND THEIR RELATION TO PHYSICAL ROADWAY CONDITIONS. THE RESULTS WILL BE USED TO IDENTIFY CRITICAL ACCIDENT LOCATIONS AND CONDITIONS THAT CAUSE ACCIDENTS. THE SYSTEM IS FOUNDED ON A GEOGRAPHIC DATA BASE THAT ALLOWS AUTOMATIC ASSIGNMENT OF X-Y COORDINATES TO ALL CODED ACCIDENTS. THE PROCESS REQUIRES ONLY SIMPLE INFORMATION COMMONLY CODED ON ACCIDENT FORMS. BECAUSE OF ITS UNIQUE DESIGN, IT PROVIDES A COMPREHENSIVE SYSTEM CAPABLE OF EFFICIENT AND MEANINGFUL ANALYSIS OF CODED ACCIDENT INFORMATION. ROADWAY SECTIONS, INTERSECTIONS, CORRIDORS, AND GEOGRAPHIC AREAS CAN BE EXAMINED OVER ANY SPECIFIED PERIOD OF TIME FOR A COMPLETE ACCIDENT HISTORY. ACCIDENTS CAN BE IDENTIFIED BY TYPE, PRECISE LOCATION, OR ANY OTHER DESCRIPTIVE CRITERIA INCLUDED ON ACCIDENT REPORT FORMS. ACCIDENTS CAN ALSO BE CORRE-

LATED WITH ROADWAY CHARACTERISTICS, JURISDICTION, AND FEDERAL-AID CLASSIFICATION.

by JAMES P. KLAUSMEIER; GERALD KMACK  
VOGT, SAGE, AND PFLUM CONSULTANTS,  
INDIANAPOLIS, IND.  
Publ: HS-023 303 (TRR-643), "TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS," WASHINGTON, D.C., 1977 P1-6  
1977  
PREPARED FOR PRESENTATION AT 56TH ANNUAL MEETING OF TRANSPORTATION RES. BOARD.  
SPONSORED BY COM. ON TRAFFIC RECORDS.  
Availability: IN HS-023 303

HS-023 305

#### SAMPLING PROCEDURE USING MULTISTATE TRAFFIC RECORDS TO SELECT ACCIDENT AND EXPOSURE DATA-COLLECTION SITES

A SAMPLING TECHNIQUE HAS BEEN DEVELOPED FOR SELECTING 80 ROADWAY SEGMENTS AT WHICH LARGE-TRUCK ACCIDENT AND EXPOSURE DATA WILL BE COLLECTED IN VARIOUS STATES. THESE SEGMENTS COMPRISE APPROXIMATELY 1609 KM (1000 MI) OF HIGHWAY THROUGHOUT SIX PARTICIPATING STATES (CALIFORNIA, MARYLAND, MICHIGAN, NEVADA, PENNSYLVANIA, AND TEXAS). A TYPOLOGY WAS CREATED TO PARTITION ALL ROADWAYS INTO SIX EXCLUSIVE TYPES. TWO CLASSIFICATION VARIABLES WERE USED: ROAD LOCATION (URBAN AND RURAL LEVELS) AND ROADWAY TYPE (PRIMARY, SECONDARY, AND INTERSTATE LEVELS). ROADWAY TYPE WAS NESTED WITHIN ROAD LOCATION. IN EACH STATE, A MULTISTAGE STRATIFIED RANDOM SAMPLING OF ROADWAY SEGMENTS WAS DRAWN WITHIN EACH ROADWAY TYPE. THE DISTRIBUTION OF LARGE-TRUCK ACCIDENTS EXPERIENCED WAS THEN PLOTTED FOR THOSE SEGMENTS SAMPLED. POTENTIAL DATA-COLLECTION SITES WERE IDENTIFIED BY USING A TWO-WAY STRATIFICATION METHOD BASED ON HISTORIC TRUCK-ACCIDENT DISTRIBUTION CURVES. THE FINAL SITES WERE SELECTED BY A TEAM OF TRAINED FIELD CREWS AFTER ON-THE-SCENE EVALUATION OF THE POTENTIAL SITES. THESE CREWS BASED THEIR DECISIONS ON PREVIOUSLY SPECIFIED SELECTION CRITERIA (E.G. WEIGHT DATA AND ABILITY TO COLLECT EXPOSURE DATA). ACCIDENTS ARE NOW BEING INVESTIGATED AT THE SELECTED SITES; LARGE-TRUCK ACCIDENT RATES ARE TO BE MEASURED AND VEHICLE EXPOSURE TO BE SAMPLED SIMULTANEOUSLY FOR ONE YEAR.

by CHANG S. YOO; MARTIN L. REISS  
BIOTECHNOLOGY, INC., FALLS CHURCH, VA.  
Publ: HS-023 303 (TRR-643), "TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS," WASHINGTON, D.C., 1977 P6-9  
1977; 2REFS  
PREPARED FOR PRESENTATION AT 56TH ANNUAL MEETING OF TRANSPORTATION RES. BOARD.  
SPONSORED BY COM. ON TRAFFIC RECORDS.  
RESEARCH IS PART OF A STUDY SPONSORED BY FEDERAL HWY. ADMINISTRATION.  
Availability: IN HS-023 303

HS-023 306

**FILTERING OF FATAL-ACCIDENT RATES**

THE RELATIONSHIP BETWEEN THE U.S. ECONOMY AND NATIONAL FATAL ACCIDENT RATES ON A PER VEHICLE BASIS WAS ANALYZED. FATAL MOTOR VEHICLE ACCIDENT COUNTS GIVEN BY THE NATIONAL SAFETY COUNCIL DIVIDED BY THE NUMBER OF REGISTERED VEHICLES (THE TOTAL OF AUTOMOBILES, BUSES, AND TRUCKS) GIVEN BY THE FEDERAL HWY. ADMINISTRATION WERE USED AS FATAL ACCIDENT RATES. ALTHOUGH THE RELATIONSHIP IS OBSCURED BY THE STRONG DOWNWARD TREND IN THE ACCIDENT-RATE DATA, THERE ARE CONSISTENCIES APPARENT IN THE DATA. ACCIDENT RATES HISTORICALLY (1949 TO 1973) HAVE DECREASED DURING RECESSION PERIODS AND INCREASED OR CHANGED IN RATE OF DECREASE AFTER EACH RECESSION PERIOD. OF THE SPECIFIC ECONOMIC MEASURES STUDIED, NATIONAL UNEMPLOYMENT RATES SHOWED THE HIGHEST CORRELATION ( $R = 0.86$ ) WITH FATAL ACCIDENT RATES THAT WERE ADJUSTED FOR THE DOWNWARD TREND. BECAUSE THE PERFORMANCE OF THE ECONOMY SEEMS TO HAVE AN EFFECT ON FATAL ACCIDENT RATES, IT MAY BE HAZARDOUS TO COMPARE FATAL-ACCIDENT DATA FROM ONE YEAR TO ANOTHER WITHOUT CONSIDERING THE ECONOMIC CONDITIONS IN THE YEARS COMPARED.

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Publ: HS-023 303 (TRR-643), "TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS," WASHINGTON, D.C., 1977 P10-2  
1977; 6REFS  
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Availability: IN HS-023 303

HS-023 307

**ANALYSIS OF COUNTYWIDE ACCIDENT DATA BY RATE AND FREQUENCY**

A METHODOLOGY FOR THE ANALYSIS OF LARGE NUMBERS OF TRAFFIC ACCIDENT LOCATIONS HAS BEEN DEVELOPED AND IMPLEMENTED IN OAKLAND COUNTY, MICH., AS PART OF A COUNTYWIDE COMPREHENSIVE TRAFFIC ENGINEERING PROJECT. THE METHODOLOGY USES BOTH ACCIDENT-FREQUENCY AND ACCIDENT-RATE DATA FOR EACH INTERSECTION AND HIGHWAY LINK TO IDENTIFY THE MOST CRITICAL LOCATIONS. THE PROCEDURE STRATIFIES THE DATA FROM A NUMBER OF INTERSECTIONS (OR LINKS) AND ASSIGNS EACH LOCATION TO A CELL WITHIN A MATRIX THAT CONSIDERS ACCIDENT FREQUENCY ON THE HORIZONTAL AXIS AND ACCIDENT RATE ON THE VERTICAL AXIS. THE LOCATIONS CONTAINED IN THE CELL CORRESPONDING TO THE HIGHEST FREQUENCY AND THE HIGHEST RATE ARE IDENTIFIED AS THE MOST CRITICAL LOCATIONS. LOCATIONS WITH A HIGH FREQUENCY AND A LOW RATE OR A HIGH RATE AND A LOW FREQUENCY ARE CONSIDERED LESS CRITICAL. A

COMPUTER PROGRAM WAS DEVELOPED THAT DETERMINES THE RATE AND FREQUENCY FOR ALL HIGHWAY LOCATIONS (INTERSECTIONS OR LINKS) BEING ANALYZED, ASSIGNS EACH LOCATION THE APPROPRIATE CELL IN THE RATE AND FREQUENCY MATRIX, AND THEN PREPARES REPORTS INDICATING THE LOCATIONS CONTAINED IN EACH CELL AND THE PERTINENT DATA FOR EACH LOCATION. THE RATE AND FREQUENCY ANALYSIS PROCEDURE WAS TESTED BY USING COUNTYWIDE ACCIDENT DATA, AS WELL AS DATA FROM SMALLER POLITICAL JURISDICTIONS, AND WAS AN EFFECTIVE AND VALUABLE TRAFFIC-ENGINEERING TOOL.

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Availability: IN HS-023 303

HS-023 308

**EFFECTIVENESS OF SELECTIVE ENFORCEMENT IN REDUCING ACCIDENTS IN METROPOLITAN TORONTO [CANADA]**

THE AVAILABILITY OF COMPUTERIZED ACCIDENT RECORDS FOR THE METROPOLITAN TORONTO (ONT., CANADA) POLICE SELECTIVE ENFORCEMENT PROGRAM PROVIDED A UNIQUE OPPORTUNITY TO TEST WHETHER INCREASED ENFORCEMENT OF TRAFFIC LAWS WAS FOLLOWED BY A REDUCTION IN THE NUMBER OF ACCIDENTS. BY USING ACCIDENT RECORDS FOR 1800 LOCATIONS OVER A PERIOD OF FOUR YEARS, ESTIMATES OF ACCIDENT RATES WERE OBTAINED THAT ACCOUNTED FOR A TIME TREND AND SEASONAL VARIATIONS. THE EXPECTED NUMBER OF ACCIDENTS SO OBTAINED WAS COMPARED TO THE NUMBER OF RECORDED ACCIDENTS. LOCATIONS THAT RECEIVED INCREASED ENFORCEMENT SHOWED CONSISTENTLY FEWER THAN THE EXPECTED NUMBER OF ACCIDENTS. IN THE EXPERIMENT, ALL IMPORTANT FACTORS EXCEPT INCREASE IN ENFORCEMENT WERE RANDOMIZED. THUS, UNLESS THERE IS SOME UNDETECTED CAUSAL FACTOR, THE REDUCTION IN ACCIDENTS IS STATISTICALLY SIGNIFICANT AND CAN BE ATTRIBUTED TO THE INCREASED ENFORCEMENT. IF THEN, SELECTIVE ENFORCEMENT LEADS TO A REDUCTION IN ACCIDENTS, ENFORCEMENT OF TRAFFIC LAWS IN GENERAL HAS THE POTENTIAL TO REDUCE ACCIDENTS. THEREFORE, IT IS IMPORTANT TO DEPLOY AVAILABLE ENFORCEMENT RESOURCES TO MAXIMIZE THEIR EFFECT.

by EZRA HAUER; PETER J. COOPER  
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CANADA, ROAD AND MOTOR VEHICLE TRAFFIC SAFETY BRANCH, CANADA  
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 Availability: IN HS-023 303

HS-023 309

### **EFFECTS OF THE 88.5 KM/H (55-MPH) SPEED LIMIT AND ITS ENFORCEMENT ON TRAFFIC SPEEDS AND ACCIDENTS**

AFTER A BRIEF REVIEW OF SOME OF THE MOST PERTINENT LITERATURE ON THE EFFECT OF THE 88.5 KM/H (55 MPH) SPEED LIMIT ON VEHICLE SPEEDS AND ACCIDENTS, TRAFFIC DATA FROM NORTH CAROLINA, MISSISSIPPI, AND LOUISIANA ARE ANALYZED TO SHOW THE PROBABLE ROLE OF LAW ENFORCEMENT IN MAKING THE SPEED LIMIT MORE EFFECTIVE. ALTHOUGH SEVERAL OF THE MANY STUDIES ON THE EFFECT OF THE 55 MPH SPEED LIMIT MENTION THE NEED FOR ENFORCEMENT TO MAKE THE SPEED LIMIT MORE EFFECTIVE, MOST DO NOT PRESENT ANY ENFORCEMENT DATA. TIME-SERIES PLOTS OF SPEED, VOLUME, AND ACCIDENT DATA FOR NORTH CAROLINA ARE GIVEN FOR 1973 AND 1974. TIME-SERIES GRAPHS OF ENFORCEMENT DATA FOR NORTH CAROLINA, MISSISSIPPI, AND LOUISIANA AND LOUISIANA SPEED, VOLUME, AND ACCIDENT DATA HAVE BEEN DEVELOPED FROM THE PUBLISHED QUARTERLY AND ANNUAL REPORTS (1970'S) OF THE STATE POLICE AND HIGHWAY AGENCIES. THE INITIAL DECREASE IN SPEEDS CAUSED BY THE ENERGY CRISIS (BEGINNING IN FALL OF 1973) IN THE THREE STATES HAS BEEN ERODED IN THE PAST TWO YEARS; EXCEPT FOR INTERSTATE HIGHWAYS, SPEEDS HAVE RETURNED TO PRE-CRISIS LEVELS. OF PARTICULAR IMPORTANCE, HOWEVER, ARE THAT SPEEDS ARE NOW MORE UNIFORM (LOWER STANDARD DEVIATIONS AND INCREASED PACE-GROUP PERCENTAGES) AND THAT VERY FEW VEHICLES ARE EXCEEDING 105 KM/H (65 MPH). THERE ARE STRONG INDICATIONS THAT THE INCREASED ENFORCEMENT LEVELS OF 1974 TO 1976 ARE RESPONSIBLE FOR MAINTAINING THE MORE UNIFORM AND SAFER SPEED LEVELS. LOUISIANA DATA FOR 1974 AND 1975, AS COMPARED WITH DATA FOR 1971 AND 1972, SHOW NOT ONLY SIGNIFICANTLY FEWER FATALITIES ON THE RURAL HIGHWAYS, BUT ALSO LARGE REDUCTIONS IN THE PERCENTAGES OF ALL RURAL ACCIDENTS AND OF RURAL FATAL ACCIDENTS FOR WHICH EXCESSIVE SPEED WAS CITED AS A CONTRIBUTING FACTOR. A MORE DETAILED

STUDY OF ENFORCEMENT VS. ACCIDENT RATE IS FELT WARRANTED.

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 Publ: HS-023 303 (TRR-643), "TRAFFIC RECORDS, LAW ENFORCEMENT, AND MOTORIST-AID SYSTEMS," WASHINGTON, D.C., 1977 P23-32  
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 Availability: IN HS-023 303

HS-023 310 11

### **RELATIONSHIP OF THE COLOR OF THE HIGHWAY CENTERLINE STRIPE TO THE ACCIDENT RATE IN ARIZONA**

THE EFFECT OF CHANGING THE COLOR OF THE CENTERLINE STRIPE FROM WHITE TO YELLOW ON THE ACCIDENT RATE ON UNDIVIDED, TWO-LANE, TWO-WAY HIGHWAYS IN ARIZONA WAS INVESTIGATED. ONLY SECTIONS OF ROADWAY THAT HAD REMAINED ESSENTIALLY UNCHANGED (EXCEPT FOR THE COLOR OF THE CENTERLINE STRIPE) FOR A PERIOD OF ONE YEAR BEFORE AND ONE YEAR AFTER THE COLOR CHANGE WERE STUDIED. ACCIDENT DATA ON 74 SECTIONS OF ROADWAY, TOTALLING 4587 KM (2867 MI), WERE ANALYZED AND STATISTICALLY TESTED FOR DIFFERENCES BETWEEN THE ACCIDENT RATES WITH WHITE AND WITH YELLOW CENTERLINES UNDER VARIOUS ROAD SURFACE AND LIGHT CONDITIONS. OF THE EIGHT ACCIDENT-RATE CATEGORIES TESTED, THE FOLLOWING FOUR SHOWED A SIGNIFICANT INCREASE: THE DAWN OR DUSK ACCIDENT RATE, THE DAWN OR DUSK ACCIDENT RATE DURING PERIODS OF WET PAVEMENT OR POOR VISIBILITY, THE NIGHTTIME ACCIDENT RATE DURING PERIODS OF WET PAVEMENT OR POOR VISIBILITY, AND THE OVERALL ACCIDENT RATE DURING PERIODS OF WET PAVEMENT OR POOR VISIBILITY. THE FOLLOWING OTHER FOUR CATEGORIES TESTED SHOWED NO SIGNIFICANT CHANGE: THE NIGHTTIME ACCIDENT RATE, THE DAYTIME ACCIDENT RATE, THE DAYTIME ACCIDENT RATE DURING PERIODS OF WET PAVEMENT OR POOR VISIBILITY, AND THE OVERALL ACCIDENT RATE UNDER ALL CONDITIONS COMBINED. THESE DATA INDICATE THAT THE CURRENTLY USED YELLOW CENTERLINE STRIPES ARE INFERIOR TO THE PREVIOUSLY EMPLOYED WHITE CENTERLINE STRIPES.

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 Availability: IN HS-023 303

S PART OF THE DALLAS (TEXAS) CORRIDOR STUDY, RESEARCH AND DEMONSTRATION PROJECT CONCERNED WITH INSTRUMENTATION, SURVEILLANCE, AND CONTROL OF URBAN FREEWAY AND ARTERIAL ACILITIES, A FREE TELEPHONE DIAL-IN SERVICE WAS DEVELOPED TO PROVIDE TRAVEL INFORMATION TO THE DRIVER BEFORE HE/SHE LEAVES HIS/HER HOME OR OFFICE. THE SYSTEM WAS TERMINATED AFTER APPROXIMATELY 18 MONTHS BECAUSE OF LACK OF USE BY THE DRIVING PUBLIC. GENERAL PUBLIC APATHY TOWARD THE SERVICE WAS DEMONSTRATED BY BOTH THE NUMBER OF CALLS RECEIVED DAILY AND THE RESPONSE TO DIRECT MAIL QUESTIONNAIRES. DESPITE THE FACT THAT THOSE RECEIVING THE SURVEY QUESTIONNAIRES WERE AMONG THE GROUP RECEIVING INFORMATION ABOUT THE SERVICE, OVER HALF HAD NOT EVEN TRIED IT. AN AVERAGE OF 83 CALLS/DAY WERE RECEIVED DURING THE FIRST YEAR OF OPERATION; SOME DAYS THERE WERE AS FEW AS 30 CALLS. THE PRIMARY REASON GIVEN FOR NOT USING THE SERVICE WAS THAT THE RESPONDENT DID NOT KNOW ABOUT IT OR FORGOT ABOUT IT, DESPITE THE FACT THAT ALL OF THEM HAD RECEIVED AT LEAST ONE LETTER DESCRIBING THE SERVICE AND, IN MANY CASES, A STICK-ON LABEL WITH THE SERVICE NUMBER PRINTED ON IT. THE NEXT MOST FREQUENT REASON FOR NOT USING THE SERVICE WAS THAT CONDITIONS WOULD CHANGE BETWEEN THE TIME OF THE CALL AND THE TIME OF THE DRIVER'S ARRIVAL AT THE FREEWAY. EIGHTY PERCENT OF THE QUESTIONNAIRE RESPONDENTS DESCRIBED THE INFORMATION AS EITHER ALWAYS OR USUALLY ACCURATE, AND 95% DESCRIBED THE 30-SECOND MESSAGE AS ABOUT THE RIGHT LENGTH. DIRECT MAIL PUBLICITY WAS THE MOST EFFECTIVE MEANS OF INCREASING THE NUMBER OF CALLS, BUT ANY INCREASES WERE TEMPORARY. THE SERVICE DID NOT SUSTAIN AN ACCEPTABLE LEVEL OF USE. ALTHOUGH IT WAS NOT SUBSTANTIATED TOTALLY IN THE DATA, IT APPEARED THAT THE ROUTINE NATURE OF MESSAGES ON NONINCIDENT DAYS CAUSED CALLERS TO LOSE INTEREST IN THE SERVICE AND DISCONTINUE CALLING. HOWEVER, UNUSUAL WEATHER OR ACCIDENTS APPEARED TO REMIND SOME DRIVERS THAT THE SERVICE WAS AVAILABLE. IT IS CONCLUDED THAT IF A DIAL-IN SERVICE IS OFFERED, IT SHOULD BE IN CONJUNCTION WITH OTHER INFORMATION-DISSEMINATION MODES IN ORDER TO ELIMINATE THE TIME-LAG (BETWEEN CALL AND FREEWAY ARRIVAL) PROBLEM CITED BY QUESTIONNAIRE RESPONDENTS. IN ADDITION TO DIRECTING HUMAN-FACTORS RESEARCH TOWARD THE DRIVER OR USER OF INFORMATION SYSTEMS, IT SHOULD BE DIRECTED TOWARD THOSE WHO OPERATE THE SYSTEM IN ORDER TO DETERMINE TECHNIQUES FOR SUSTAINING INTEREST AND ATTENTION WHERE MUCH OF

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 Availability: IN HS-023 303

HS-023 312

# **BULB-LOSS EFFECTS ON MESSAGE READABILITY OF MOTORIST-INFORMATION MATRIX SIGNS**

THE AMOUNT OF LIGHT-BULB LOSS THAT CAN BE TOLERATED IN AN ELECTRONIC MOTORIST-INFORMATION SIGN BEFORE THE MESSAGE BECOMES ILLEGIBLE, MISUNDERSTOOD, OR MISINTERPRETED, WAS INVESTIGATED. A REPRESENTATIVE GROUP OF TRAFFIC-DESCRIPTOR AND ADVISORY WORDS AND ROUTE NUMERALS WERE DISPLAYED ON A REAL-TIME MATRIX SIGN. SELECTED PERCENTAGES (10% TO 50%) OF BULBS WERE FAILED IN A RANDOM PATTERN, AND SLIDES WERE TAKEN OF THE RESULTING DISPLAYS. THESE SLIDES WERE SHOWN TO SUBJECTS WHO WERE INSTRUCTED TO RESPOND BY WRITING THE WORD IF IT WERE ILLEGIBLE. FROM THESE DATA, SPECIFICATIONS FOR 85TH AND 95TH PERCENTILE CORRECT COMPREHENSION WERE DETERMINED FOR BOTH FAMILIAR AND UNFAMILIAR MOTORISTS. THE PERCENTAGE OF BULB FAILURES MUST NOT BE GREATER THAN AS FOLLOWS: UNFAMILIAR DRIVER (TOURIST OR INFREQUENT TRIP MAKER), 8 (95TH PERCENTILE) AND 18 (85TH PERCENTILE); AVERAGE DRIVER, 14 (95TH) AND 28 (85TH); AND FAMILIAR DRIVER (COMMUTER OR DAILY TRIP MAKER), 28 (95TH) AND 44 (85TH). BULB REPLACEMENT CRITERIA FOR A SPECIFIED LEVEL OF LEGIBILITY PERFORMANCE VARY WITH THE MOTORIST STATE. AT THE 85TH PERCENTILE PERFORMANCE CRITERION, FOR BOTH FAMILIAR AND UNFAMILIAR MOTORISTS, BULB REPLACEMENT WILL PROBABLY BE CONTROLLED BY APPEARANCE (E.G. 10% BULB LOSS) RATHER THAN BY LEGIBILITY. THE MATRIX SIGN MAY BE LEGIBLE AT A LEVEL OF BULB LOSS AT WHICH THE OVERALL APPEARANCE IS UNACCEPTABLE. ONLY IN THE UNFAMILIAR STATE AND AT THE 95TH PERCENTILE DOES THE BULB-REPLACEMENT CRITERION APPROACH THAT DESIGNATED BY SIGN MANUFACTURERS (APPROXIMATELY 10%). MESSAGES WITH ROUTE NUMBERS ARE READ WITH DIFFICULTY AT BULB FAILURES BEYOND APPROXIMATELY 15%. SPECIAL CONSIDERATIONS ARE ADVISED FOR ROUTE NUMERAL BULB REPLACEMENT SPECIFICATIONS. THE MANUFACTURER'S SPECIFICATIONS FOR BULB REPLACEMENT SHOULD BE ADHERED TO BEYOND A 10% FAILURE RATE. THERE IS A NEED FURTHER TO



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HS-023 313

### **SURVEY OF MOTORIST ROUTE-SELECTION CRITERIA**

TWO SURVEYS WERE CONDUCTED IN TEXAS TO INVESTIGATE THE CRITERIA DRIVERS USE IN SELECTING ROUTES TO TRAVEL. A SAMPLE OF 202 DRIVERS FROM THE CENTRAL BUSINESS DISTRICT OF DALLAS WHO WERE DAILY COMMUTERS WAS SELECTED TO RESPOND TO A WORK-TRIP QUESTIONNAIRE. THE COMMUTERS WERE ASKED TO DESCRIBE THE ROUTES THEY REGULARLY TOOK, THE ALTERNATIVE ROUTES, AND THE REASONS FOR THEIR CHOICE OF ROUTE. ANOTHER SECTION OF THE QUESTIONNAIRE ASKED QUESTIONS RELATED TO REASONS FOR SELECTING PARTICULAR ALTERNATIVE ROUTES, IF SO DONE, OR REASONS FOR DECIDING TO WAIT OUT TRAFFIC JAMS, OR HOW THE EXISTENCE OF ADVANCE INFORMATION WOULD HAVE INFLUENCED ROUTE-CHOICE DECISIONS. ANOTHER SAMPLE OF 215 DRIVERS WAS INTERVIEWED AT REST STOPS ON AN INTERSTATE LEADING INTO HOUSTON. OF THEM, 123 REPORTED A DESTINATION WITHIN THE CITY AND 92 A DESTINATION BEYOND THE CITY; 35% OF THOSE HAVING A DESTINATION WITHIN THE CITY AND 76% OF THE THROUGH MOTORISTS WERE UNFAMILIAR WITH THE CITY. THE REST-STOP SUBJECTS WERE ASKED TO DESCRIBE THE ROUTE THEY PLANNED TO TAKE, WHETHER THEY KNEW OF OTHER ROUTES, AND SPECIFICALLY WHY THEY HAD CHOSEN THE ROUTE THEY HAD PREVIOUSLY DESCRIBED. THEY WERE ALSO ASKED WHY THEY HAD NOT TAKEN A FAMILIAR ALTERNATIVE ROUTE. A SECOND SERIES OF QUESTIONS RELATED TO WHAT THEY WOULD DO IN A SITUATION IN WHICH THEY LEARNED OVER THE RADIO THAT TRAFFIC WAS STOP-AND-GO AHEAD (BECAUSE OF AN INCIDENT) AND THE REASONS FOR THEIR ACTIONS AND WHAT INFORMATION THEY WOULD LIKE TO KNOW IN ADVANCE ABOUT THE ROUTE THEY HAD CHOSEN. THE CRITERIA FOR TAKING ALTERNATIVE ROUTES WERE FOUND TO BE FAIRLY CONSISTENT BOTH AMONG MOTORISTS AND BY THE SAME MOTORIST AT DIFFERENT TIMES. THE COMMONALITIES IN THE REASONS GIVEN FOR SELECTING ROUTES SUGGEST THAT A MESSAGE SYSTEM COULD SATISFY THE NEEDS OF A GREAT MAJORITY BY PRESENTING TRAFFIC INFORMATION AND POSITIVE ROUTE GUIDANCE. THE UNFAMILIAR MO-

GESTION WOULD HAVE DIVERTED IF THEY HAD HAD ADDITIONAL INFORMATION. WHILE 72% OF DRIVERS SAID THEY WOULD DIVERT ON HEARING AN INCIDENT ADVISORY, FEW COULD RECALL INSTANCES OF ACTUALLY DOING SO. ONE REASON FOR THIS MAY BE LACK OF ADEQUATE INFORMATION ON WHERE DIVERSION ROUTES ARE AND HOW TO GET TO THEM. FINALLY, DRIVERS ARE NOT COMMITTED TO A SINGLE ROUTE. TYPICAL ROUTE-CHOICE DECISIONS, AS WELL AS INCIDENT-RELATED DECISIONS, ARE DICTATED BY DRIVER EXPECTATIONS REGARDING COMPARATIVE TRAFFIC CONDITIONS ON THE ROUTES.

by R. DALE HUCHINGSON; R. W. MCNEES; CONRAD J. DUDEK  
TEXAS A AND M UNIV., TEXAS TRANSPORTATION INST., COLLEGE STATION, TEX.  
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HS-023 314

### **MOTORIST-AID SYSTEM ON A RURAL FREEWAY: THE ILLINOIS EXPERIENCE**

THE STATE OF ILLINOIS HAS INSTALLED AN EXPERIMENTAL MOTORIST-AID TELEPHONE SYSTEM ALONG 221 KM (138 MI) OF INTERSTATE 80 BETWEEN ROCK ISLAND AND JOLIET. THE SYSTEM CONSISTS OF 302 ROADSIDE TERMINALS IN PAIRS, ONE TELEPHONE IN EACH DIRECTION OF TRAVEL, AT APPROXIMATELY 1.6-KM (1-MI) INTERVALS. BEFORE AND-AFTER STUDIES WERE CONDUCTED TO EVALUATE THE EFFECTIVENESS OF THE SYSTEM IN TERMS OF SYSTEM USE, RESPONSE TIME, CONVENIENCE, RELIABILITY, AND COSTS. THE SOURCES FOR THESE DATA WERE STOPPED-VEHICLE SURVEYS, STATE POLICE ASSISTANCE-RENDERED REPORTS, SERVICE UNIT ASSISTANCE-RENDERED REPORTS, A PUBLIC OPINION SURVEY, AND A MOTORIST-AID-SYSTEM USE SURVEY. THE MAJOR FINDINGS ARE THAT APPROXIMATELY 24% OF ALL I-80 AID CANDIDATES ARE USING THE MOTORIST-AID SYSTEM, THAT THE AVERAGE TIME BETWEEN INCIDENT OCCURRENCE AND POLICE NOTIFICATION WAS REDUCED FROM 15.5 MINUTES IN THE BEFORE PERIOD TO 12 MINUTES IN THE AFTER PERIOD AND TO 9 MINUTES WHEN THE AID TELEPHONES WERE USED, AND THAT THE COST EFFECTIVENESS OF THE SYSTEM, CONSIDERING ACCIDENT REDUCTION AND



MCDERMOTT  
ILLINOIS DEPT. OF TRANSPORTATION, BUREAU OF  
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HS-023 315

### **TRANSPORTATION FACTS AND TRENDS. 13TH ED.**

THIS COMPILATION OF STATISTICAL TABLES AND GRAPHS PROVIDES INFORMATION SHOWING THE IMPORTANCE OF TRANSPORTATION TO THE U.S. AND POINTING OUT TRENDS IN THIS FIELD. INFORMATION IS LIMITED TO GENERAL AND ACROSS-THE-BOARD DATA, IN ORDER TO PREVENT REPETITION OF SINGLE-MODAL STATISTICAL DATA PUBLISHED BY OTHER TRANSPORTATION ASSOCIATIONS. DETAILED SOURCE INFORMATION IS INCLUDED IN A SPECIAL APPENDIX, WHICH INCLUDES EXPLANATIONS OF THE METHODS USED TO ESTIMATE MANY OF THE FIGURES SHOWN IN THE TABLES. TWO QUARTERLY SUPPLEMENTS (JAN 1978 AND APR 1978) HAVE BEEN INSERTED AND BRING UP TO DATE, REVISE, OR ADD TO THE STATISTICAL DATA IN THIS EDITION. INFORMATION ON THE FOLLOWING ASPECTS OF U.S. TRANSPORTATION IS PROVIDED: CURRENT TRAFFIC TRENDS (TRANSPORTATION PERFORMANCE INDICATORS); IMPORTANCE OF TRANSPORTATION TO THE U.S. ECONOMY; NATIONAL ECONOMIC TRENDS VS. TRANSPORTATION TRENDS 1939-1976; TRANSPORTATION OUTLAYS VS. GROSS NATIONAL PRODUCT (GNP); AND THE NATION'S ESTIMATED FREIGHT BILL. ALSO INCLUDED ARE THE NATION'S ESTIMATED PASSENGER BILL; REVENUES OF THE ICC (INTERSTATE COMMERCE COMMISSION) AND CAB (CIVIL AERONAUTICS BOARD) REGULATED CARRIERS IN DOMESTIC OPERATIONS; AND TRANSPORTATION REVENUE VS. GENERAL PRICE TRENDS. OTHER SUBJECTS INCLUDE THE FOLLOWING: INTERCITY FREIGHT BY MODES; INTERCITY FREIGHT FEDERALLY REGULATED; INTERCITY TONNAGE CARRIED BY MODE; REGULATED INTERCITY SMALL SHIPMENTS TRAFFIC; SHIPMENTS BY MANUFACTURING ESTABLISHMENTS (TON-MILES AND TONS); AVERAGE LENGTH OF FREIGHT HAUL IN DOMESTIC COMMERCE; AND AVERAGE LOAD, CAPACITY, LOAD FACTOR, AND LENGTH OF HAUL (INTERCITY PASSENGER). DATA ARE GIVEN FOR THE FOLLOWING: POSTAL SERVICE PAYMENTS TO U.S. CARRIERS FOR TRANSPORT OF DOMESTIC MAIL; PASSENGER FATALITIES IN TRANSPORT VEHICLES; INTERCITY TRAVEL BY MODES; INTERCITY PASSENGERS CARRIED; TRAVEL BY U.S. RESIDENTS; OVERSEAS TRAVEL BY U.S. RESIDENTS; U.S. EMPLOYMENT IN TRANSPORTATION BY OCCUPATIONS; U.S. EMPLOYMENT IN TRANSPORTATION AND RELATED INDUSTRIES; AND AVERAGE ANNUAL EARNING AND COM-

TRANSPORT FACILITIES; FEDERAL AND STATE TAXES DERIVED FROM TRANSPORTATION; AND NET INVESTMENT IN PRIVATELY OWNED TRANSPORT EQUIPMENT FACILITIES ARE ALSO CONSIDERED. OTHER TABLES CONCERN EXPENDITURES FOR NEW PLANT AND EQUIPMENT BY TRANSPORT AND RELATED INDUSTRIES; ESTIMATED NUMBER OF PRIVATELY AND PUBLICLY OWNED TRANSPORT UNITS; BASIC INTERCITY TRANSPORTATION MILEAGE WITHIN THE CONTINENTAL U.S.; AND TRANSPORTATION DEMAND VS. TOTAL DOMESTIC DEMAND FOR PETROLEUM. DATA ARE ALSO PROVIDED ON STANDING CONGRESSIONAL COMMITTEES HAVING JURISDICTION OVER TRANSPORTATION; TRANSPORT RESPONSIBILITIES IN THE EXECUTIVE BRANCH; DEPT. OF TRANSPORTATION ORGANIZATION AND RESPONSIBILITIES; AND FEDERAL TRANSPORTATION REGULATORY AGENCIES.

TRANSPORTATION ASSOC. OF AMERICA, 1100 17TH  
ST., N.W., SUITE 1107, WASHINGTON, D.C. 20036  
1977; 82P REFS  
Availability: CORPORATE AUTHOR

HS-023 316

### **HOW TO SAVE \$3000 WORTH OF FUEL A YEAR [TRACTOR-TRAILERS]**

BASED ON THE DEPT. OF ENERGY'S JOINT INDUSTRY-GOVERNMENT VOLUNTARY TRUCK ECONOMY PROG., A NUMBER OF TESTED, EFFECTIVE WAYS TO REDUCE HORSEPOWER AND SAVE FUEL (AT LEAST \$3000 PER YEAR) IN THE OPERATION OF A TRACTOR-TRAILER ARE OUTLINED. EVERY 1% REDUCTION IN FUEL CONSUMPTION YIELDS \$122 PER TRACTOR PER YEAR. BY USING AERODYNAMIC DEVICES, 4% TO 8% IN FUEL CAN BE SAVED. FURTHER REDUCTIONS IN HORSEPOWER AND FUEL ARE OFFERED BY A SWITCH FROM BIAS TO RADIAL TIRES. RADIAL TIRES REDUCE ROLLING RESISTANCE AND THEREBY SAVE FUEL IN AMOUNTS ESTIMATED AT 3% TO 10%. ANOTHER GOOD BET FOR SAVING FUEL IS THE POWERTRAIN (ENGINE, TRANSMISSION, AND REAR AXLE). DEPENDING ON THE CHANGES MADE (E.G. CUTTING BACK ON OPERATING SPEED (RPM'S)), A SAVINGS OF 4% TO 8% IN FUEL CAN BE REALIZED. NOT MUCH CAN BE DONE ABOUT ELIMINATING HORSEPOWER DEMAND ON MOST OF THE ENGINE ACCESSORIES, BUT THE FAN USAGE CAN BE REDUCED BY UTILIZING A FAN CLUTCH. INDUSTRY TESTING HAS FOUND THAT THE FAN IS NEEDED ONLY 5% OF TOTAL ENGINE RUNNING TIME. WITHOUT APPRECIABLY LENGTHENING TRIP TIME, FUEL CAN BE SAVED BY REDUCING EXCESS HORSEPOWER TO A MINIMUM, DEPENDING ON GRADES AND ROUTE REQUIREMENTS, AND BY RATING THE ENGINE FOR HIGH-TORQUE RISE TO MINIMIZE SHIFTING. ANOTHER AREA OF THE VEHICLE WHERE SAVINGS CAN BE MAXIMIZED IS THE TRANSMISSION; FEW SHIFTS PLUS FEWER ENGINE RPM'S MEAN INCREASED FUEL ECONOMY. WHEN ORDERING A NEW TRUCK, SIX-SPEED OR NINE-SPEED

TRANSMISSIONS, MATCHED TO THE HIGH-TORQUE RISE ENGINES, SHOULD BE CONSIDERED TO GET MOST FUEL SAVINGS. ALSO, WITH RESPECT TO BUYING A NEW TRUCK, A CHANGE IN THE AXLE RATIO FROM 4.4 TO 3.9 OR 3.7 WILL REDUCE RPM'S AND RESULT IN FUEL SAVINGS. FINALLY, A LIFE CYCLE PURCHASING EVALUATION CAN AID IN MAKING ECONOMICALLY SOUND DECISIONS ON WHETHER OR NOT TO BUY FUEL SAVINGS DEVICES. TO MAKE SUCH AN EVALUATION, ADD UP THE INITIAL INVESTMENT, VEHICLE LIFE MAINTENANCE COST, INTEREST ON INVESTMENT COST, AND PRODUCT RELIABILITY COST AND DEDUCT THIS TOTAL FROM THE SAVINGS OR PROFIT THE DEVICE WILL PROVIDE AND VALUE OF THE DEVICE AT TRADE-IN. THIS PROVIDES THE TOTAL LIFETIME BENEFIT OR RETURN ON INVESTMENT.

Publ: OWNER OPERATOR V8 N3 P33-9 (MAY-JUN 1978)  
1978

Availability: SEE PUBLICATION

HS-023 317

#### **A REVIEW OF CAB INSTRUMENTS [TRUCK INSTRUMENT PANELS]**

TRUCK CAB INSTRUMENTS ARE REVIEWED WITH RESPECT TO THE INFORMATION THEY PROVIDE AND HOW SUCH INFORMATION SHOULD BE INTERPRETED AND PROPERLY USED. THE FOLLOWING BASIC INSTRUMENTATION IS DISCUSSED: AIR RESERVOIR PRESSURE GAUGE, AIR APPLICATION PRESSURE GAUGE, OIL PRESSURE GAUGE, OIL TEMPERATURE GAUGE, COOLANT TEMPERATURE GAUGE, BATTERY CHARGE AND CONDITION INDICATORS, VACUUM GAUGE, TACHOMETER, EXHAUST PYROMETER, AIR MANIFOLD PRESSURE GAUGE, AND CONTROL HANDLES AND BUTTONS SUCH AS INTERAXLE DIFFERENTIAL OR POWER DIVIDER, TRAILER EMERGENCY OR TRAILER AIR SUPPLY (NOT FOR PARKING), SYSTEM PARK, PUSH TO CHARGE TRAILER WHEN PARKED, AND FRONT BRAKE LIMITING CONTROL.

by KENNETH R. BABB  
Publ: OWNER OPERATOR V8 N3 P48-51 (MAY-JUN 1978)  
1978  
Availability: SEE PUBLICATION

HS-023 318

#### **WHEEL ALIGNMENT--PT. 3. ADJUSTING "THE NON-ADJUSTABLE" ANGLES**

THREE ALIGNMENT ANGLES GENERALLY REFERRED TO AS BEING "NON-ADJUSTABLE" ARE CONSIDERED, AS WELL AS SOME SPECIAL ALIGNMENT PROBLEMS. THESE "NON-ADJUSTABLE" ANGLES ARE AS FOLLOWS: STEERING AXIS INCLINATION (S.A.I.), ALSO KNOWN AS KING PIN INCLINATION (K.P.I.), OR SOMETIMES, BALL JOINT INCLINATION; INCLUDED ANGLE, AN ANGLE FOUND BY ADDING S.A.I. AND THE CAMBER ANGLE TAKEN WHILE WHEELS ARE JACKED UP (IN MOST INSTANCES); AND TURNING ANGLE, SOMETIMES CALLED TOE OUT ON TURNS. THESE ANGLES CAN BE CHANGED,

BUT THERE ARE NO SPECIFIC ADJUSTMENTS FOR THEM; THEY ARE CHANGED BY CHANGING PARTS IN THE FRONT END. THESE ANGLES, S.A.I. AND TURNING ANGLE PARTICULARLY, ARE USED TO LOCATE BENT OR DAMAGED PARTS IN THE FRONT END. WHEN SIDE-TO-SIDE VARIANCES ARE FOUND TO BE GREATER THAN THE ACCEPTABLE 1.5°, IT IS GENERALLY ASSUMED THAT THERE ARE BENT OR DAMAGED PARTS WHICH NEED REPLACEMENT. FOR EXAMPLE, INCORRECT TURNING ANGLE MIGHT VERY WELL INDICATE BAD STEERING ARMS; INCORRECT S.A.I. MIGHT INDICATE A BENT SPINDLE. WHEN PARTS ARE REPLACED IN THE FRONT END, THESE ANGLES NEED TO BE RECHECKED IN ORDER TO BE SURE THAT THE PROBLEM AREA HAS INDEED BEEN CORRECTED. SOME SPECIAL ALIGNMENT PROBLEMS THAT REQUIRE MEASUREMENT USING SOPHISTICATED, DYNAMIC ALIGNMENT MACHINES INCLUDE TWO PHENOMENA RELATED TO TIRES AND THEIR CONSTRUCTION: CONICITY (OR CAMBER-ICITY) AND TIRE PULL (LATERAL TIRE FORCE). DIAGRAMS ARE PROVIDED WHICH ILLUSTRATE PROBLEMS WHICH A MECHANIC MIGHT FACE EVEN AFTER HAVING DONE AN OTHERWISE "PERFECT" ALIGNMENT JOB. REAR-WHEEL MISALIGNMENT CAN CAUSE PROBLEMS SUCH AS WHEN THE CAR TENDS TO LEAD TO ONE SIDE, OR TO "DOG-LEG," WHICH MAY BE THE RESULT OF THE REAR-WHEEL "THRUST-LINE." THE "THRUST-LINE" IS THE IMAGINARY LINE MARKING THE ACTUAL DIRECTION IN WHICH THE VEHICLE WILL ATTEMPT TO MOVE, DUE TO THE DIRECTION OF THE THRUST OF THE REAR WHEELS. SOME GENERAL TIPS ARE OUTLINED TO AID THE TIRE SERVICE SPECIALIST IN CHECKING CARS RETURNED AFTER ALIGNMENT JOBS.

Publ: NTDRA DEALER NEWS V41 N8 P15-21 (MAY 1978)  
1978  
THE TIRE SERVICE SPECIALIST.  
Availability: SEE PUBLICATION

HS-023 319

#### **MOPEDS**

TOP-OF-THE-LINE MODELS OF MOPEDS FROM SIX PRINCIPAL EUROPEAN MANUFACTURERS, ONE JAPANESE PRODUCER, AND THREE AMERICAN COMPANIES WERE TESTED AND ARE RANKED. WHILE BREAKING IN THE MOPEDS ACCORDING TO THE MANUFACTURERS' INSTRUCTIONS (USUALLY 300 TO 600 MILES OF DRIVING DURING WHICH CONTINUOUS FULL-THROTTLE OPERATION IS FORBIDDEN), THE MILEAGE WAS LOGGED AT ABOUT 15 MPH, GIVING THE TEST DRIVERS PLENTY OF TIME TO BECOME THOROUGHLY FAMILIAR WITH EACH MACHINE'S PERFORMANCE. BY BLENDING THE BEST QUALITIES OF ALL THE MOPEDS THAT WERE RIDDEN, AN IDEALIZED MODEL OF WHAT A MOPED WOULD BE LIKE IF IT HAD THE BEST OF EVERYTHING WAS CONCEIVED. SUCH AN IDEAL MOPED WOULD HAVE PREDICTABLE AND "FORGIVING" HANDLING CHARACTERISTICS SO THAT MANEUVERS COULD BE MADE WITH EASY CONFIDENCE AND RECOVERY COULD BE QUICK AND NATURAL IF A WHEEL DID START TO SLIP. THE IDEAL MOPED WOULD HAVE ENOUGH SPEED TO KEEP PACE WITH IN-TOWN

TRAFFIC AND ENOUGH ACCELERATION TO PULL AWAY FROM A LIGHT WITHOUT IMPEDING TRAFFIC. THE BRAKES WOULD BE EASY TO USE AND CAPABLE OF BRINGING THE MOPED TO A SURE, QUICK STOP. THE IDEAL MOPED WOULD ALSO HAVE A SUSPENSION CAPABLE OF SMOOTHING OUT NORMAL ROAD BUMPS; AND, JUST AS IMPORTANT, IT WOULD HAVE A COMFORTABLE SEAT. NONE OF THE TESTED MOPEDS LIVED UP TO THIS IDEAL. LISTED IN ORDER OF ESTIMATED OVERALL QUALITY, THE TESTED MOPEDS (ALL HAVING 50-CU-CM, TWO-STROKE ENGINES THAT REQUIRE AN OIL/GASOLINE MIXTURE FOR FUEL, WEIGHING ABOUT 100 TO 110 LB, AND HAVING SPRING SUSPENSIONS, FRONT AND REAR) ARE MOTOBECANE 50 VLC, PUCH MAXI, VESPA BRAVO DELUXE, PUCH MAXI SPORT, BATAVUS, COLUMBIA COMMUTER, TOWARDS IMPERIAL 57508 (ESSENTIALLY SIMILAR TO COLUMBIA COMMUTER), AND GARELLI GRAN SPORT. THE HONDA HOBBIT WAS JUDGED NOT ACCEPTABLE BECAUSE FRONT BRAKES WERE CAPABLE OF PITCHING THE VEHICLE OVER; OTHERWISE, IT WOULD HAVE BEEN TOP-RATED. THE CIMATTI CITYBIKE WAS JUDGED NOT ACCEPTABLE BECAUSE BRAKES WERE EVALUATED AS DANGEROUSLY INEFFECTIVE.

Publ: CONSUMER REPORTS V43 N6 P319-26 (JUN 1978)  
1978

Availability: SEE PUBLICATION

HS-023 320

#### MODELS OF GAP ACCEPTANCE BY QUEUES AT INTERSECTIONS

TWO MODELS OF GAP ACCEPTANCE BY LINES OF VEHICLES AT T-JUNCTIONS, AS APPLIED TO EMPIRICAL DATA FROM TWO JUNCTIONS IN SOUTHERN ENGLAND (ONE INVOLVING A MERGING MANEUVER, THE OTHER A SIMPLE CROSSING TURN), ARE COMPARED. (QUEUE ACCEPTANCE IS DEFINED AS THE ACCEPTANCE OF A LARGE GAP IN A MAJOR ROAD TRAFFIC STREAM BY TWO OR MORE WAITING VEHICLES IN LINE ON A MINOR ROAD.) THE TWO MODELS USE DIFFERENT AMOUNTS OF THE LARGE QUANTITY OF DATA AVAILABLE FROM INTERSECTION OBSERVATIONS. A DIRECT LINEAR RELATIONSHIP MAKES USE OF THE INFORMATION ABOUT THE LINES OF VEHICLES ONLY (I.E. THE NUMBER OF TURNING VEHICLES IN EACH LINE AND THE SIZE OF THE GAPS THEY ACCEPT). THE EXPLANATORY MODEL USES FAR MORE INFORMATION ABOUT TRAFFIC BEHAVIOR. EACH OF THE COMPONENTS OF THE MODEL, THE START-UP TIME DISTRIBUTION, THE MOVE-UP TIME DISTRIBUTION, AND THE RESIDUAL LAG DISTRIBUTION, MAY CONTAIN DATA FROM MANEUVERS OTHER THAN QUEUE ACCEPTANCE. IN ITS USE OF DATA, THE EXPLANATORY MODEL APPEARS PREFERABLE, ENABLING RELIABLE AND MORE REPRESENTATIVE RESULTS TO BE OBTAINED FROM SHORTER PERIODS OF OBSERVATION.

by DALE F. COOPER; JENNY WENNELL  
Publ: TRAFFIC ENGINEERING AND CONTROL V19 N4  
P178-80, 185 (APR 1978)  
1978; 12REFS  
Availability: SEE PUBLICATION

HS-023 321

#### START-UP TIMES AND QUEUE ACCEPTANCE OF LARGE GAPS AT T-JUNCTIONS

START-UP TIMES OF VEHICLES ON A MINOR ROAD AT A PRIORITY T-JUNCTION WERE STUDIED IN RELATION TO THEIR POSITION IN A LINE AS WELL AS THE BEHAVIOR OF THE VEHICLES IN MOVING INTO LARGE GAPS. (THE START-UP TIME IS THE TIME TAKEN BY THE VEHICLE TO ENTER THE INTERSECTION.) THESE STUDIES WERE LIMITED TO LEFT-TURNING VEHICLES AT A STOP-SIGN CONTROLLED T-JUNCTION IN A DRIVE-LEFT SYSTEM. IT WAS FOUND THAT THE MOVEMENT OF THE QUEUED TURNING VEHICLES FROM A STOP SIGN (WHERE THE SIGHT DISTANCE OF THE FIRST DRIVER IN THE LINE WAS APPROXIMATELY 300 M, FOLLOWED BY 45 M FOR THE NEXT DRIVER, AND NO SIGHT OF APPROACHING TRAFFIC FOR OTHER VEHICLES IN-LINE UNTIL ENTERING INTERSECTION) CONSISTED OF AN INITIAL MOVEMENT OF THE FIRST VEHICLE, ANTICIPATING THE ARRIVAL OF AN ACCEPTABLE GAP, FOLLOWED BY LONGER AND SUCCESSIVELY LONGER MOVEMENTS OF QUEUED VEHICLES INTO THE SUCCESSIVELY SMALLER LAG. (QUEUE ACCEPTANCE IS DEFINED AS THE ACCEPTANCE OF A LARGE GAP BY MORE THAN ONE VEHICLE FROM THE LINE OF WAITING VEHICLES. THE ACCEPTANCE BY A SINGLE VEHICLE ONLY IS CONSIDERED EITHER AS A GAP OR AS AN UNDELAYED LAG ACCEPTANCE.) AS THE TRAFFIC VOLUME ON THE MAJOR ROAD INCREASED, QUEUED VEHICLES ON THE MINOR ROAD SHOWED A TREND TO MOVE MORE RAPIDLY INTO THE LAG, BUT NO MORE RAPIDLY INTO THE INITIAL GAPS. AS THE SPEED OF THE APPROACHING VEHICLE INCREASED, QUEUED VEHICLES DID NOT SHOW ANY NOTICEABLE CHANGE IN THEIR START-UP TIMES, EITHER INTO INITIAL GAPS OR INTO LAGS. THE MODEL N00.286T-0.74 MAY BE USED TO ESTIMATE THE MEDIAN NUMBER OF QUEUED VEHICLES WHICH WILL ACCEPT A GAP OF SIZE T SECONDS IN A SIMPLE LEFT-TURN MERGE SITUATION. THIS MODEL WAS OBTAINED FROM OBSERVATIONS AT A SITE WITH POOR SIGHT DISTANCES, AND OVER A RANGE OF TRAFFIC SPEEDS AND VOLUMES DURING PEAK PERIODS ONLY. GOOD SIGHT DISTANCES SHOULD RESULT IN LARGER N VALUES. SEPARATE MODELS MAY BE DERIVED FOR OTHER MORE LIMITED RANGES OF SPEEDS OR VOLUMES. THE RESULTS OF THIS STUDY SHOULD BE OF VALUE TO THE TRAFFIC ENGINEER IN PREDICTING THE CAPACITY OF A T-JUNCTION, BASED ON KNOWN FLOWS OF A MAJOR ROAD, SUCH AS THE EXIT CAPACITY OF THE PARKING AREA OF A NEW, LARGE SHOPPING CENTER.

by CHARLES B. UBER  
Publ: TRAFFIC ENGINEERING AND CONTROL V19 N4  
P174-7 (APR 1978)  
1978; 9REFS  
Availability: SEE PUBLICATION

VARIOUS ENGINES INTRODUCED IN AMERICAN 1978 MODEL YEAR AUTOMOBILES AND TRENDS FOR THE NEAR FUTURE ARE OUTLINED. THE 1978 MODEL YEAR WILL PROVE TO BE A SIGNIFICANT TIME IN THE HISTORY OF AUTOMOTIVE POWERPLANTS. THIS YEAR HAS SEEN THE INTRODUCTION OF THE THREE-WAY CATALYST IN SIGNIFICANT NUMBERS, THE DEBUT OF THE FIRST U.S.-MADE PASSENGER CAR DIESEL POWERPLANT, A FURTHER PROLIFERATION OF ELECTRONIC CONTROLS, THE OFFERING OF WHAT WILL PROVE TO BE A NEW GENERATION OF TURBOCHARGED POWERPLANTS BY BOTH U.S. AND FOREIGN AUTO MANUFACTURERS, AND A FURTHER SPREADING OF THE V-6 ENGINE FORMAT. ALL OF THESE DEVELOPMENTS WILL PROVE TO BE SIGNIFICANT LANDMARKS IN ENGINE DEVELOPMENT AS THE AUTO INDUSTRY MOVES INTO THE 1980'S. THEY WILL ALL GROW IN USAGE IN THE COMING YEARS, AS THE AUTO MAKERS STRIVE TO MEET THE 27.5 MPG (11.7 KML) CORPORATE AVERAGE FUEL ECONOMY (CAFE) GOAL MANDATED FOR 1985, WHILE STILL MEETING TOUGH EMISSION REQUIREMENTS.

by RICHARD J. FOSDICK

Publ: AUTOMOTIVE INDUSTRIES V158 N7 P26-32 (MAY 1978)

1978

Availability: SEE PUBLICATION

HS-023 323

### **ROBOTS SET FOR AUTOMOTIVE ASSAULT [AUTOMOBILE MANUFACTURING]**

IN THE U.S. AND FOREIGN COUNTRIES (E.G. JAPAN, ITALY, SWEDEN, ENGLAND, AND GERMANY), ROBOTS ARE NOW DEMONSTRATING THE ABILITY TO DO ALMOST EVERY MANUAL JOB INVOLVED IN BUILDING CARS. THE GENERAL ATTITUDE AROUND THE AUTO INDUSTRY STRONGLY SUGGESTS THAT ROBOTICS, THE SCIENCE OF MANUFACTURING WITH ROBOTS, HAS REACHED A POINT WHERE IT IS NOW PRACTICAL FOR THE CAR MAKERS TO BEGIN DOING MANY MORE AUTOMOTIVE JOBS WITH ROBOTS. THE MAIN TWO REASONS FOR THE BRIGHT OUTLOOK FOR INDUSTRIAL ROBOTS ARE THAT THE COST OF USING ROBOTS, COMPARED TO THE COSTS OF EMPLOYEES, HAS GROWN GREATLY TO FAVOR THE ROBOTS IN THE PAST DECADE, AND EMPLOYEES ARE BECOMING INCREASINGLY OPPOSED TO DOING DISTASTEFUL AUTOMOTIVE JOBS SUCH AS WELDING, FORGING, DIE CASTING, AND CAR PAINTING. WITHIN A FEW YEARS, IT IS LIKELY THAT ROBOTS WILL BE PAINTING THE GREAT MAJORITY OF ALL AUTOMOBILES. A ROBOT CAN BE EASILY AND QUICKLY TAUGHT TO PERFORM AS MANY AS 3000 DIFFERENT ACTIONS. IN ADDITION TO THE INCREDIBLE MEMORY AND "TEACHABILITY" THAT A COMPUTER CAN GIVE A ROBOT, ROBOTS ARE NOW BEING EQUIPPED WITH EITHER VISION OR TACTILE SENSING CAPABILITIES. THE FLEXIBILITY OF ROBOTS MAKES THEM ESPECIALLY APPEALING TO THE AUTO INDUSTRY. GENERAL MOTORS (GM) IS GENERALLY CONSIDERED TO BE THE U.S. AUTOMO-

MANY MORE... COUPLE OF YEARS. GM AND OTHER AUTO MANUFACTURERS SEEM TO RELY ON THE OUTSIDE FIRMS TO DEVELOP AND PRODUCE THE ROBOTS, WHILE THEIR MANUFACTURING DEVELOPMENT GROUPS DESIGN THE PROCESS SYSTEMS FOR THE ROBOTS. AUTO FACTORIES WILL NOT, HOWEVER, BE COMPLETELY "MANNED" BY ROBOTS, BECAUSE OF THE HUGE COSTS THAT WOULD BE REQUIRED AND BECAUSE OF THE SOCIAL PRESSURE AGAINST ELIMINATING ALL HUMAN BEINGS FROM THE WORKPLACE.

by JOSEPH M. CALLAHAN

Publ: AUTOMOTIVE INDUSTRIES V158 N7 P37-41 (MAY 1978)

1978

Availability: SEE PUBLICATION

HS-023 324

### **FOREIGN NOISE RESEARCH IN SURFACE TRANSPORTATION**

FOREIGN NOISE ABATEMENT RESEARCH IN SURFACE TRANSPORTATION IS SUMMARIZED TO SUPPLEMENT THE INFORMATION PROVIDED IN THE U.S. INTERAGENCY NOISE RESEARCH PANEL REPORT ON U.S.-SPONSORED NOISE ABATEMENT RESEARCH COMPLETED, IN PROGRESS, OR PLANNED. THE INFORMATION WAS COLLECTED BY INQUIRIES TO FOREIGN INDIVIDUALS AND ORGANIZATIONS, AND BY INQUIRIES MADE AT THE NINTH INTERNATIONAL CONGRESS ON ACOUSTICS, JULY 1977, IN MADRID, IN ALL, ABOUT 1300 REQUESTS. THE PROJECTS WERE CATEGORIZED INTO HIGHWAY NOISE (MEDIUM AND HEAVY TRUCKS, LIGHT VEHICLES, BUSES, HIGHWAY PLANNING AND LAND MANAGEMENT, HIGHWAY MODEL ANALYSIS AND PREDICTION, OTHER), OFF-HIGHWAY AND RECREATIONAL VEHICLE NOISE (MOTORCYCLES, MOTORBOATS), RAIL NOISE (LOCOMOTIVES AND PASSENGER TRAINS, RAPID RAIL TRANSIT, INNOVATIVE GUIDED MASS TRANSIT, RAIL MODEL ANALYSIS AND PREDICTION, OTHER), SURFACE VEHICLE COMPONENTS NOISE (ENGINE, EXHAUST MUFFLERS, POWER TRAIN, TIRES, OTHER), MEASUREMENT AND ENFORCEMENT (METHODOLOGY AND STANDARDS, TRAINING), AND ACOUSTIC PROPERTIES (PROPAGATION, BARRIERS, ARCHITECTURAL ACOUSTICS, IMPACT AND VIBRATION, OTHER). IN ALMOST ALL COUNTRIES MOST OF THE RESEARCH REPORTED WAS GOVERNMENT-SPONSORED. THERE ARE FEWER DEVELOPMENTAL THAN FUNDAMENTAL PROJECTS, AND FEWER DEMONSTRATION THAN DEVELOPMENTAL. CZECHOSLOVAKIA, JAPAN, POLAND, UNITED KINGDOM, AND WEST GERMANY PERFORMED MOST OF THE DEMONSTRATION WORK, WITH TWO OR MORE PROJECTS AT LEAST PARTIALLY DEMONSTRATION IN NATURE. FUNDING BY COUNTRY IS SHOWN. OF THE TYPES OF NOISE SOURCE CONSIDERED, HIGHWAY NOISE ABATEMENT RECEIVED THE MOST ATTENTION: 368 RESEARCH PROJECTS OUT OF 109 REPORTED. IN AD-

DITION, A LARGE NUMBER OF PROJECTS FROM THE SURFACE VEHICLE COMPONENTS, MEASUREMENT AND ENFORCEMENT, AND ACOUSTIC PROPERTIES CATEGORIES DEALT WITH HIGHWAY NOISE. RAIL NOISE ABATEMENT FOLLOWED SECOND IN THE LEVEL OF RESEARCH EFFORT, AND OFF-HIGHWAY AND RECREATIONAL VEHICLE NOISE RESEARCH A DISTANT THIRD. CONSIDERING THE RESEARCH BY CATEGORY, HIGHWAY NOISE HAD THE HIGHEST LEVEL OF EFFORT, FOLLOWED BY SURFACE VEHICLE COMPONENTS, ACOUSTIC PROPERTIES, MEASUREMENT AND ENFORCEMENT, AND RAIL NOISE; OFF-HIGHWAY AND RECREATIONAL VEHICLES HAD THE LOWEST AMOUNT OF RESEARCH EFFORT.

ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF NOISE ABATEMENT AND CONTROL, WASHINGTON, D.C. 20460  
Rept. No. EPA-550/9-78-301; 1977; 371P REFS  
BASED ON APPRAISAL BY INFORMATICS, INC.  
Availability: CORPORATE AUTHOR

HS-023 325

#### **THE PORSCHE 924 BODY--MAIN DEVELOPMENT OBJECTIVES**

THE APPROACH TO AND REALIZATION OF THE FOLLOWING PORSCHE 924 BODY REQUIREMENTS ARE CONSIDERED: CREATE A SPORTS COUPE WITH TWO-PLUS-TWO SEATING; MAINTAIN THE PORSCHE 911 INTERIOR DIMENSIONS WITH REDUCED OVERALL LENGTH; FULFILL WORLDWIDE SAFETY REGULATIONS AND PROVIDE FOR THE POSSIBILITY OF INTEGRATING FUTURE REQUIREMENTS; ASSURE HIGHLY ECONOMIC PRODUCTION AND OPERATION BY REDUCING OVERALL WEIGHT AND DEVELOPING AN EXTERIOR BODY SHAPE WITH A LOW DRAG COEFFICIENT; REDUCE DRIVER FATIGUE THROUGH OPTIMAL PLACEMENT AND DESIGN OF CONTROL ELEMENTS, ANATOMICALLY WELL-SHAPED SEATS, AND INFINITELY VARIABLE HEATING AND VENTILATION SYSTEMS; AND DEVELOP A CORROSION-RESISTANT AND EASILY REPAIRABLE BODY. AERODYNAMIC FEATURES STUDIED INCLUDE DRAG, LIFT, CROSS WIND, PRESSURE DISTRIBUTION ON THE VEHICLE SURFACE, AND SELF-FOULING. A SCALE MODEL WAS SUBJECTED TO WIND TUNNEL TESTS. EXTERIOR SAFETY IS ACHIEVED BY SMOOTH AND UNOBTRUSIVE EXTERIOR PANNELLING. AS FOR VISIBILITY, OBSCURATION IS NOT MORE THAN 13%. DETAILS ARE GIVEN FOR HEADLIGHTS, BUMPERS, AND THE DETACHABLE ROOF. THE CONCEPTION OF THE BODY IN WHITE IS BASED ON PASSENGER PROTECTION AT FRONTAL IMPACT SPEEDS UP TO 50 KM/H. BODY CORROSION PROTECTION PROCEDURES ARE DESCRIBED, AS ARE FEATURES OF THE INTERIOR, INCLUDING SPACE UTILIZATION, EQUIPMENT, NOISE ATTENUATION, AND VENTILATION, HEATING, AND AIR-CONDITIONING.

by HERMANN E. BURST; RAINER SROCK  
PORSCHE A.G., RES. AND DEVEL. CENTER,  
WEISSACH, GERMANY  
Rept. No. SAE-770311; 1977; 14P 3REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 326

#### **A NEW IMAGE OF A MID-ENGINE SPORTS CAR--THE LANCIA BETA SCORPION**

THE LANCIA BETA SCORPION (U.S. MARKET) OR THE BETA MONTECARLO (EUROPEAN MARKET), AN ADVANCED MID-ENGINE SPORTS CAR, REPRESENTS AN INNOVATIVE RESPONSE TO THE COMPLEX PROBLEM OF APPLYING A MID-ENGINE CONFIGURATION, DERIVED FROM THE RACING WORLD, TO AN ALL-AROUND SPORTS CAR. IN ADDITION TO THE SPORTS CAR PERFORMANCE AND HANDLING, THE SCORPION MEETS EVERYDAY REQUIREMENTS. THE INTERIOR IS ROOMY, AND ALL-AROUND VISIBILITY IS EXCELLENT; LUGGAGE SPACE IS CONSIDERABLE, AND THERE IS NO SPARE TIRE PROBLEM, AS THE TIRE IS NEATLY STOWED IN THE ENGINE COMPARTMENT. ENGINE ACCESSIBILITY IS EXCEPTIONAL FOR THIS TYPE OF CAR. BODY STYLING IS ORIGINAL, WITH TWO BODY TYPES AVAILABLE: A HARDDTOP COUPE AND A CONVERTIBLE SPIDER. SCORPION DEVELOPMENT INCLUDED EXTENSIVE AERODYNAMIC TESTING AT SEVERAL WIND TUNNEL FACILITIES. IN PARTICULAR, THE DRAG COEFFICIENT IS VERY LOW CONSIDERING THAT WITHIN THE GENERAL CONCEPT OF THE CAR, THE DRAG COEFFICIENT HAD TO BE INTEGRATED WITH THE OTHER REQUISITE DESIGN PARAMETERS. CHARACTERISTICS OF THE ENGINE; THE SUSPENSION, BRAKES, AND STEERING; THE BODY DESIGN, STRUCTURE, AND STYLING; AND INTERIOR ARE GIVEN, AS WELL AS SPECIFICATIONS OF THE ENGINE, POWER TRAIN, CHASSIS, DIMENSIONS, AND PERFORMANCE.

by S. CAMUFFO; L. FIORAVANTI  
LANCIA S.P.A., ITALY; PININFARINA S.P.A., ITALY  
Rept. No. SAE-770312; 1977; 15P  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 327

#### **A STUDY OF THE EFFECT OF OIL AND COOLANT TEMPERATURES ON DIESEL ENGINE BRAKE SPECIFIC FUEL CONSUMPTION**

TWO CONTROLLING PARAMETERS OF THE ENGINE'S THERMAL ENVIRONMENT, OIL TEMPERATURE AND COOLANT TEMPERATURE, WERE STUDIED TO DETERMINE THEIR EFFECTS ON BRAKE SPECIFIC FUEL CONSUMPTION (BSFC) AS PART OF AN OVERALL STUDY TO EVALUATE THE TECHNICAL ASPECTS OF RADIATOR SHUTTERS. THE EFFECTS WERE STUDIED FOR A TURBOCHARGED DIESEL ENGINE AND FOR A DIRECT INJECTION, NATURALLY ASPIRATED DIESEL ENGINE. A MATRIX OF TEST CONDITIONS WAS RUN ON A CUMMINS VT-903 DIESEL ENGINE TO EVALUATE THE EFFECTS OF OIL AND COOLANT TEMPERATURES ON BSFC FOR SEVERAL LOADS AND SPEEDS. LOADS AND SPEEDS WERE SELECTED BASED ON WHERE A TYPICAL SEMI-TRACTOR ENGINE WOULD OPERATE OVER THE ROAD ON A HILLS-AND-CURVES ROUTE. OIL TEMPERATURE WAS MONITORED AND CONTROLLED BETWEEN THE OIL COOLER AND THE ENGINE. COO-

LANT TEMPERATURE WAS MONITORED AND CONTROLLED AT THE ENGINE OUTLET. THE BSFC DATA WERE FIT TO A REGRESSION EQUATION AS A FUNCTION OF LOAD, SPEED, OIL TEMPERATURE, AND COOLANT TEMPERATURE FOR THE MATRIX OF TEST CONDITIONS. THE TEST RESULTS SHOW THAT BSFC DECREASES AS BOTH OIL AND COOLANT TEMPERATURES INCREASE. THE RESULTS ALSO INDICATE THAT BSFC IS MORE SENSITIVE TO CHANGES IN OIL TEMPERATURE THAN TO CHANGES IN COOLANT TEMPERATURE OVER THE RANGE OF TEST DATA. THE ANALYSIS OF THE DATA SUGGESTS SEVERAL REASONS FOR THE CHANGES IN BSFC DUE TO OIL AND COOLANT TEMPERATURE. FIRST, THE MAIN EFFECT OF CHANGING OIL TEMPERATURE IS TO CHANGE THE OIL VISCOSITY AND IN TURN THE ENGINE FRICTION THAT IS GENERATED BY THE JOURNAL BEARINGS AND OIL PUMP. SECOND, THE EFFECTS OF INCREASING COOLANT TEMPERATURE ARE TO REDUCE CYLINDER-TO-COOLANT HEAT TRANSFER, AND TO INCREASE LINER-RING FRICTION. AN EMPIRICAL EQUATION REPRESENTS THE BSFC DATA AS A FUNCTION OF THE SPEED, LOAD, OIL TEMPERATURE, AND COOLANT TEMPERATURE OVER THE RANGE OF INDEPENDENT VARIABLES.

by DAVID A. BOLIS; JOHN H. JOHNSON; RICHARD CALLEN  
MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON, MICH.  
Rept. No. SAE-770313; 1977; 11P 4REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE ENGINEERING CONGRESS AND EXPOSITION, DETROIT, 28 FEB-4 MAR 1977. BASED ON MASTER'S THESIS OF D. A. BOLIS, RESEARCH SPONSORED BY KYSOR OF CADILLAC.  
Availability: SAE

HS-023 328

### CONSIDERATIONS IN REDESIGNING A GASOLINE ENGINE INTO A DIESEL ENGINE FOR PASSENGER CAR SERVICE

FACTORS TO BE CONSIDERED IN THE CONVERSION OF AN AUTOMOTIVE PRODUCTION LINE FROM MANUFACTURE OF GASOLINE ENGINES TO MANUFACTURE OF DIESEL ENGINES AND THE DESIGN SOLUTIONS THAT WERE DEVELOPED FOR A SUCCESSFUL PRODUCTION LINE CONVERSION AT ADAM OPEL A.G. (A SUBSIDIARY OF GENERAL MOTORS IN WEST GERMANY) ARE DISCUSSED. WHEN STARTING THE DEVELOPMENT WORK AT ADAM OPEL ON THE DIESEL ENGINE TO BE INSTALLED IN A PASSENGER CAR, THE GOAL WAS TO MANUFACTURE MANY OF THE ENGINE PARTS ON THE SAME MACHINES AND EQUIPMENT WHICH HAD BEEN USED FOR THE PRODUCTION OF GASOLINE ENGINES, AND ACTUALLY TO USE MANY GASOLINE ENGINE PARTS IN THE DIESEL ENGINE. AS THE PROGRAM ADVANCED, IT WAS FOUND THAT ADDITIONAL DETAIL WORK HAD TO BE DONE TO IMPROVE COMPONENTS WITH THE SAME OR SIMILAR DIMENSIONS SO THAT THEY COULD MEET THE REQUIREMENTS OF DIESEL OPERATION AS WELL AS THE DESIRED PERFORMANCE. WAYS TO IMPROVE CRITICAL ENGINE PARTS, SUCH AS CRANKSHAFT, CONNECTING RODS, CYLINDER HEAD BOLTS, AND CAMSHAFT DRIVE,

WITHIN THE EXISTING MANUFACTURING LIMITATIONS, WERE DEVELOPED AND ARE DESCRIBED. A NEW DIESEL ENGINE CAN IN FACT BE MANUFACTURED ON A PRODUCTION LINE PREVIOUSLY USED FOR GASOLINE ENGINES.

by K. HAEFELE  
ADAM OPEL A.G., RUESSELSHEIM, WEST GERMANY  
Rept. No. SAE-770314; 1977; 12P  
PRESENTED AT INTERNATIONAL AUTOMOTIVE ENGINEERING CONGRESS AND EXPOSITION, DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 329

### POTENTIAL PASSENGER CAR DEMAND FOR DIESEL FUEL AND REFINING IMPLICATIONS

THE IMPLICATIONS OF PASSENGER CAR DIESELIZATION ON PETROLEUM INDUSTRY PROCESSING AND RAW MATERIAL REQUIREMENTS, AND ON ENERGY CONSERVATION WERE EXPLORED IN A THREE PHASE PROGRAM. THE PROGRAM CONSISTED OF THE FOLLOWING THREE STUDIES: REFINING STUDY (EVALUATION OF THE POTENTIAL ABILITY TO INCREASE AUTOMOTIVE DIESEL FUEL PRODUCTION AT THE EXPENSE OF GASOLINE PRODUCTION); VEHICLE PERFORMANCE (EVALUATION OF THE RELATIVE FUEL ECONOMY, PERFORMANCE, AND EMISSIONS OF DIESEL-POWERED PASSENGER CARS VS. SPARK-IGNITED, GASOLINE-POWERED CARS); AND IMPACT OF DIESELIZATION ON VEHICLE MILES AND CRUDE OIL REQUIREMENTS (FROM THE REFINING AND VEHICLE PERFORMANCE STUDIES, CALCULATION OF THE INCREASED AVAILABILITY IN PASSENGER CAR MILEAGE AT CONSTANT CRUDE OIL CONSUMPTION AND THE SAVINGS IN CRUDE OIL AT CONSTANT VEHICLE MILEAGE AS RELATED TO PASSENGER CAR DIESELIZATION). AS ADDITIONAL DIESEL VEHICLES ARE MANUFACTURED, IT IS DETERMINED THAT ADDITIONAL VOLUMES OF AUTOMOTIVE DIESEL FUEL CAN BE PRODUCED IN REFINERIES AT THE EXPENSE OF REDUCED GASOLINE VOLUME ON A ONE-FOR-ONE BASIS AND WITHOUT MAJOR DISRUPTION IN THE TYPE OF REFINERY FACILITIES NEEDED FOR AUTOMOTIVE DIESEL VEHICLE POPULATIONS UP TO 35%-40%. HOWEVER, SPECIFIC REFINERIES MAY HAVE DIFFICULTIES IN MEETING THESE OBJECTIVES DUE TO PROCESSING CAPABILITIES, CRUDE OIL PROCESSED OR SIZE. THE SHIFT IN AUTOMOTIVE TRANSPORTATION FUEL TO SUBSTANTIALLY HIGHER PERCENTAGES OF DIESEL FUEL WILL, HOWEVER, INCREASE THE COST OF THE DIESEL FUEL SINCE THIS FUEL MUST THEN BEAR A LARGER PROPORTION OF THE OPERATING COST NOW BORNE BY GASOLINE. THIS MAY RESULT IN A REDUCTION IN THE CURRENT COST ADVANTAGE OF DIESEL VS. GASOLINE. PRODUCT QUALITY CAN GENERALLY BE MET, BUT SPECIFIC REFINERIES WILL HAVE SERIOUS DIFFICULTIES IN MEETING CETANE NUMBER REQUIREMENTS OR THE NECESSARY LOW TEMPERATURE OPERABILITY BECAUSE OF CRUDE TYPE OR PROCESSING FACILITIES. THE GRADUAL INTRODUCTION OF DIESEL-POWERED VEHICLES IN PLACE OF GASOLINE-POWERED VEHICLES OFFERS THE POTENTIAL FOR EITHER PROVIDING SOME INCREASE IN

PASSENGER VEHICLE MILEAGES (UP TO 9%-10%) WITH LITTLE CHANGE IN CRUDE OIL REQUIREMENTS, OR MANDATING PASSENGER VEHICLE MILEAGE TO OBTAIN SOME REDUCTION (UP TO 3.5%-4%) IN CRUDE OIL REQUIREMENTS.

by E. G. BARRY; A. RAMELLA; R. B. SMITH  
MOBIL RES. AND DEVEL. CORP.  
Rept. No. SAE-770315; 1977; 12P 10REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 330

#### **WHITE PAPER ON TRANSPORTATION SAFETY. 1977 ED. [JAPAN]**

THE SEVENTH IN A SERIES OF ANNUAL REPORTS SUBMITTED BY THE JAPANESE GOVERNMENT TO THE DIET PROVIDES AN OVERALL DESCRIPTION OF TRAFFIC ACCIDENTS WHICH OCCURRED PARTICULARLY IN 1976, TRAFFIC SAFETY MEASURES TAKEN IN THE 1976 FISCAL YEAR, AND PLANS FOR TRAFFIC SAFETY MEASURES TO BE CARRIED OUT IN THE 1977 FISCAL YEAR. THE NUMBER OF CASUALTIES IN ROAD TRAFFIC ACCIDENTS IN JAPAN, AFTER REACHING A PEAK IN 1970, HAS SHOWN A STEADY DECLINE FOR SIX CONSECUTIVE YEARS SINCE 1971. THE NUMBER OF DEATHS IN 1976 WAS 9734, FALLING BELOW 10,000 FOR THE FIRST TIME SINCE 1958. THIS DOWNWARD TREND IS ATTRIBUTED TO THE OVERALL TRAFFIC SAFETY MEASURES BASED ON THE FIRST AND SECOND FUNDAMENTAL TRAFFIC SAFETY PROGRAMS DRAWN UP IN 1971 AND 1976 RESPECTIVELY. THE YEARLY NUMBER OF CASUALTIES IN ROAD TRAFFIC ACCIDENTS STILL EXCEEDS 620,000. IN 1977 SPECIAL GOVERNMENT ATTENTION WILL BE PAID TO IMPROVING ROAD SAFETY TRAFFIC FACILITIES, REINFORCING URBAN GENERAL TRAFFIC REGULATIONS, DISSEMINATING TRAFFIC SAFETY INFORMATION AND IMPROVING RAILWAY CROSSINGS, HARBORS, SHIPPING LANES AND AIR TRAFFIC SAFETY FEATURES. DATA ARE CONTAINED IN TWO SECTIONS: TRAFFIC ACCIDENT SITUATION AND TRAFFIC SAFETY MEASURES. IN THE FIRST, TABLES AND GRAPHS DETAIL 1976 ROAD TRAFFIC ACCIDENTS BY AREA AND LOCATION, BY TIME, TYPE, AND AGE GROUP; DATA ON RAILWAY AND AVIATION ACCIDENTS AND DISASTERS AT SEA ARE PRESENTED. IN THE SECOND SECTION, MEASURES TO IMPROVE TRAFFIC SAFETY ARE DETAILED ACCORDING TO LAND TRAFFIC (ROAD AND RAILWAY), MARINE TRAFFIC, AND AIR TRAFFIC. TRAFFIC SAFETY MEASURES CONSIDERED INCLUDE FINANCIAL, IMPROVEMENT OF THE TRAFFIC ENVIRONMENT, PROMOTION OF SAFETY, DRIVER OR OPERATOR EDUCATION, EQUIPMENT MAINTENANCE AND INSPECTION, TRAFFIC CONTROL AND ENFORCEMENT, IMPROVEMENT OF EMERGENCY MEDICAL FACILITIES AND RESCUE, ACCIDENT OR DAMAGE

COMPENSATION, AND RESEARCH AND DEVELOPMENT.

JAPANESE GOVERNMENT, PRIME MINISTER'S  
OFFICE, JAPAN  
Rept. No. AR-7; 1977; 244P  
Availability: INTERNATIONAL ASSOC. OF TRAFFIC AND  
SAFETY SCIENCES, 6-20, 2-CHOME, YAESU, CHUO-KU,  
TOKYO, 104, JAPAN

HS-023 331

#### **INFLUENCE OF ETHYL ALCOHOL IN MODERATE LEVELS ON THE ABILITY TO STEER A FIXED- BASED SHADOWGRAPH DRIVING SIMULATOR**

THE EFFECTS OF MODERATE LEVELS OF BLOOD ALCOHOL (50 MG% AND 75 MG%) ON ABILITY TO STEER A CONSTANTLY TURNING COURSE IN A FIXED-BASE SHADOWGRAPH DRIVING SIMULATOR WERE INVESTIGATED. AN ANALYSIS OF TRACKING ERROR RESPONSES SHOWED A STATISTICALLY SIGNIFICANT IMPAIRMENT OF THE PERFORMANCE OF SUBJECTS LESS THAN 35 YEARS OLD AT A BLOOD ALCOHOL LEVEL (BAL) OF 50 MG%. SUBJECTS OVER THE AGE OF 35 SHOWED A HIGH LEVEL OF VARIABILITY IN THE SIMULATOR PERFORMANCE WHICH PROBABLY MASKED THE EFFECTS OF THE EXPERIMENTAL VARIABLES (ALCOHOL AND VELOCITY) ON THEIR PERFORMANCE; THEY HAD MORE DIFFICULTY LEARNING TO OPERATE THE SIMULATOR THAN THE YOUNGER SUBJECTS. THE SHADOWGRAPH AUTOMOTIVE SIMULATOR ORIGINALLY WAS INTENDED TO BE USED AS A TRAINING AID IN TEACHING INDIVIDUALS HOW TO DRIVE, PARTICULARLY WITH RESPECT TO THE MECHANICS OF COORDINATING SHIFTING AND STEERING. THE STEERING HAS A NUMBER OF MECHANICAL PROBLEMS WHICH CONTRIBUTE TO AN UNREALISTIC SITUATION. FIRST, THERE IS A VERY PRONOUNCED LAG BETWEEN THE DRIVER'S EFFORT AND THE VEHICLE'S RESPONSE. THIS PROVOKES A TENDENCY TO OVERSTEER UNLESS THE SUBJECT IS WELL EXPERIENCED WITH THE MACHINE AND CAN ANTICIPATE THE EFFECT. SECOND, THE NATURE OF THE STEERING LINKAGE, THAT OF A SMALL RUBBER WHEEL ON A CANVAS-COVERED DISK, CAUSES SLIPPAGE WHEN THE VEHICLE IS SUDDENLY TURNED. THE OLDER SUBJECTS' DIFFICULTY IN ACHIEVING COMPETENCY WITH THIS DEVICE UNDOUBTEDLY CONTRIBUTED TO THEIR HIGHER MEAN ERROR SCORE AND INCREASED VARIABILITY OF PERFORMANCE. ALTHOUGH THE GROUP UNDER THE AGE OF 35 SEEMED TO MASTER THE SIMULATOR QUITE WELL DURING THEIR TRAINING SESSIONS, THERE STILL WAS A MARKED VARIABILITY PROBABLY CAUSED BY THE SIMULATOR. BECAUSE OF ITS MECHANICAL LIMITATIONS, THE SHADOWGRAPH SIMULATOR IS NOT A GOOD CHOICE FOR STUDIES OF DIRECTIONAL CONTROL OR LANE KEEPING.

by ANDREW B. DOTT; ROBERT K. MCKELVEY  
Publ: HUMAN FACTORS V19 N3 P295-300 (JUN 1977)  
1977; 5REFS  
Availability: SEE PUBLICATION



**ALCOHOL AND ROAD TRAFFIC INJURY**

IN AN EFFORT TO ESTABLISH WHETHER THERE IS A RELATIONSHIP BETWEEN ALCOHOL CONSUMPTION AND MOTOR VEHICLE ACCIDENT INJURIES, BLOOD ALCOHOL CONCENTRATIONS (BAC'S) WERE DETERMINED IN 115 PERSONS WHO WERE INVOLVED IN TRAFFIC ACCIDENTS AND ADMITTED TO THE JOHANNESBURG GENERAL HOSPITAL (SOUTH AFRICA) OVER A ONE-MONTH PERIOD IN APR AND MAY 1976. STATISTICS RELEASED BY THE TRAFFIC DEPT. OF THE CITY OF JOHANNESBURG FOR 1974 AND 1975 APPEAR TO DENY THAT ALCOHOL CONSUMPTION IS A MAJOR CAUSE OF MOTOR VEHICLE ACCIDENTS. OF THE 115 PERSONS STUDIED, APPROXIMATELY ONE THIRD HAD BAC'S WHICH EXCEEDED THE LEGAL LIMIT OF 0.08 G/100 ML; 78% OF THE PERSONS WHO HAD ALCOHOL IN THEIR BLOOD WERE SEEN ON FRIDAY AND SATURDAY NIGHTS. THERE WERE MORE THAN TWICE THE PERCENTAGES OF SERIOUS INJURIES AND MINOR FRACTURES AMONG SUBJECTS WHO HAD INGESTED ALCOHOL, BUT THERE WAS NO SIGNIFICANT DIFFERENCE BETWEEN THOSE WHO HAD ALCOHOL IN THEIR BLOOD AND THOSE WHO DID NOT WITH REGARD TO MINOR INJURIES AND CONCUSSION. THERE WAS A DEFINITE PREPONDERANCE OF SERIOUS INJURIES AMONG DRIVERS WHO HAD BEEN DRINKING, WITH AN EXPECTED VERY HIGH INCIDENCE AMONG UNPROTECTED MOTORCYCLISTS WHO HAD BEEN DRINKING. THIS TREND WAS ALSO EVIDENT IN PEDESTRIANS, BUT THERE WAS NO SIGNIFICANT DIFFERENCE BETWEEN THE TWO GROUPS IN THE INCIDENCE OF SERIOUS INJURY WHERE PASSENGERS WERE CONCERNED. IT WOULD APPEAR THAT ALCOHOL PLAYS A LARGER ROLE IN ACCIDENTS AND INJURIES THAN HAS PREVIOUSLY BEEN ACKNOWLEDGED. IT IS RECOMMENDED THAT ALL EMERGENCY ROOMS BE EQUIPPED WITH SPECIALLY PREPARED AND SEALED BOTTLES FOR BLOOD ALCOHOL DETERMINATION, AND THAT THE NEAREST POLICE STATION BE CONTACTED TO ENSURE THE COOPERATION OF THE LAW WHEN THE NEED ARISES.

by R. A. M. MYERS; J. J. F. TALJAARD; K. M. PENMAN  
 Publ: SOUTH AFRICAN MEDICAL JOURNAL V52 N8  
 P328-30 (13 AUG 1977)  
 1977; 9REFS  
 Availability: SEE PUBLICATION

HS-023 333

**EPA'S RULEMAKING PROGRAM AND STRATEGIES FOR REDUCING SURFACE TRANSPORTATION NOISE**

PROGRESS TO DATE OF THE ENVIRONMENTAL PROTECTION AGENCY'S (EPA) NOISE REGULATORY PROG. FOR SURFACE TRANSPORTATION VEHICLES IS REPORTED. THREE SECTIONS OF THE NOISE CONTROL ACT, PASSED MORE THAN FIVE YEARS AGO, SPELL OUT EPA'S RESPONSIBILITIES FOR REQUIRING BY REGULATION THE REDUCTION OF NOISE FROM PRODUCTS IN THE SURFACE TRANSPORTATION CATEGORY. SECTIONS 17 AND 18 IMPOSE,

RESPECTIVELY, SPECIFIC DEADLINES ON EPA FOR REGULATING NOISE FROM INTERSTATE RAILROADS AND MOTOR CARRIERS. THE THIRD APPLICABLE SECTION, SECTION 6, IS BROADER. IT DOES NOT IDENTIFY SPECIFIC TRANSPORTATION PRODUCTS FOR REGULATION BUT CHARGES EPA TO IDENTIFY MAJOR NOISE SOURCES IN THE ENVIRONMENT, INCLUDING TRANSPORTATION PRODUCTS, AND PROCEED TO REGULATE THEM. THERE ARE OTHER DIFFERENCES BETWEEN SECTIONS 6 AND SECTIONS 17 AND 18. WHEREAS SECTION 6 LIMITS NOISE REGULATION TO NEWLY MANUFACTURED PRODUCTS AT THE TIME OF THEIR SALE, SECTIONS 17 AND 18 WERE WRITTEN BY CONGRESS TO APPLY TO THE IN USE OPERATION OF BOTH EXISTING AND NEW MOTOR CARRIER AND RAILROAD EQUIPMENT. FURTHERMORE, CONGRESS DID NOT SPECIFY DEADLINES IN SECTION 6 FOR THE MAJOR SOURCES EPA WAS REQUIRED TO IDENTIFY. RATHER, THE CONGRESS INCLUDED TIMETABLES FOR THE DEVELOPMENT OF REGULATIONS ONCE THE SPECIFIC PRODUCTS WERE SELECTED. INITIAL REGULATIONS UNDER SECTIONS 17 AND 18 HAVE BEEN PUBLISHED. BUT A FEDERAL COURT HAS SENT EPA BACK TO THE DRAWING BOARD FOR INTERSTATE RAILROADS BECAUSE, IN THE COURT'S OPINION, EPA MISINTERPRETED THE STATUTORY MANDATE OF SECTION 17. EPA EFFORTS UNDER SECTION 6 TO IDENTIFY AND REGULATE MAJOR NOISE SOURCES ARE STILL UNDERWAY. IT IS UNDER THIS SECTION THAT THE MAJORITY OF EPA'S SURFACE TRANSPORTATION NOISE CONTROL PROGRAMS FALL. THE STATUS OF EPA PROGRAMS TO CONTROL TRANSPORTATION NOISE IS REVIEWED FOR EACH OF THE FOLLOWING AREAS: INTERSTATE MOTOR CARRIERS, MEDIUM AND HEAVY TRUCKS, BUSES, MOTORCYCLES, LIGHT MOTOR VEHICLES, TIRES, MUFFLER LABELING, INTERSTATE RAILROADS, SNOWMOBILES, MOTORBOATS, AND GUIDED MASS TRANSIT.

by WILLIAM E. ROPER  
 ENVIRONMENTAL PROTECTION AGENCY,  
 WASHINGTON, D.C. 20460  
 1978; 20P 1REF  
 PRESENTED AT SAE CONGRESS AND EXPOSITION,  
 DETROIT, 3 MAR 1978.  
 Availability: CORPORATE AUTHOR

HS-023 334

**ALCOHOL-INDUCED CHANGES IN CONTRAST SENSITIVITY FOLLOWING HIGH-INTENSITY LIGHT EXPOSURE [HUMAN EYE]**

NINE SUBJECTS PARTICIPATED IN A DOUBLE-BLIND EXPERIMENT INVOLVING THREE DOSE LEVELS OF ALCOHOL (INCLUDING PLACEBO) TO STUDY THE EFFECTS OF ALCOHOL ON THE CONTRAST SENSITIVITY OF THE EYE FOLLOWING EXPOSURE TO BRIGHT LIGHT. THE LUMINANCE PARAMETERS OF THE TEST WERE COMPARABLE TO THOSE ENCOUNTERED IN PRACTICAL SITUATIONS SUCH AS DRIVING. RELATIVELY LOW DOSES OF ALCOHOL (0.5 AND 1.0 ML/KG BODY WEIGHT) WERE FOUND TO PRODUCE LARGE, SIGNIFICANT, DOSE-RELATED INCREASES IN THE TIME REQUIRED TO RECOVER FOVEAL CONTRAST



SENSITIVITY FOLLOWING HIGH-INTENSITY LIGHT EXPOSURE. THE ALCOHOL-INDUCED DELAY IN GLARE RECOVERY IS PROBABLY RETINAL AND LASTS FOR SEVERAL HOURS AFTER DRINKING. THE PERIOD OF RECOVERY FROM GLARE IS A PERIOD OF RELATIVE BLINDNESS FOR THE INDIVIDUAL AND IS THUS POTENTIALLY HAZARDOUS. THE SKY MAY ACT AS AN EXTENDED GLARE SOURCE FOR THE AUTOMOBILE DRIVER, PARTICULARLY SOON AFTER SUNRISE AND JUST BEFORE SUNSET. THE SKY LUMINANCE LEVELS UNDER THESE CONDITIONS MAY BE AS HIGH AS THOSE EXPERIENCED BY THE SUBJECTS IN THIS EXPERIMENT. UNDER CERTAIN CIRCUMSTANCES, A DRIVER WILL BE FORCED INTERMITTENTLY TO VIEW VERY BRIGHT SKY OR BE SUBJECTED TO HIGH LUMINANCE GLARE FROM LIGHT SCATTERED BY THE WINDSHIELD. FOLLOWING THE GLARE, IMPORTANT FEATURES OF THE DRIVING ENVIRONMENT ARE LOST OR LESS VISIBLE FOR RECOVERY TIMES OF MANY SECONDS. ALCOHOL PROLONGS THIS RECOVERY. THE POSSIBLE CONSEQUENCES OF AN ADDITIONAL 30%-50% DELAY IN SEEING CRITICAL DETAIL UNDER DRIVING CONDITIONS ARE OBVIOUS.

by ANTHONY J. ADAMS; BRIAN BROWN; MERTON C. FLOM  
DADA-17-73-C-3106  
Publ: PERCEPTION AND PSYCHOPHYSICS V19 N3 P219-25 (1976)  
1976; 19REFS  
Availability: SEE PUBLICATION

HS-023 335

#### AUTOMOBILE ENGINEERING--A STYLISTS VIEW

MAJOR INFLUENCES ON CAR DESIGN IN THE UNITED KINGDOM FOR THE NEXT FEW YEARS AND LIKELY RESPONSES TO THESE BY THE AUTO INDUSTRY ARE SUMMARIZED BY LEYLAND CARS' DIRECTOR OF STYLING. AT THE MOMENT, THE HATCHBACK IS POPULAR: A REAR DOOR AND FOLDING REAR-SEAT ARRANGEMENT CAN BE ACHIEVED WITHOUT ANY DRAWBACKS IN APPEARANCE, SECURITY, NOISE, OR COMFORT. PEOPLE ARE COMING TO VIEW THEIR CARS MORE CORRECTLY AS WORKING TOOLS, AND SLIGHTLY LESS AS STATUS SYMBOLS; IN ADDITION, SOCIOLOGICAL TRENDS MAKE THE ADAPTABLE LOAD SPACE CONCEPT VERY ATTRACTIVE TO A GROWING NUMBER OF CAR BUYERS. THE CURRENT INTEREST IN AERODYNAMICS WILL DEVELOP IN GREATER DEPTH. AS THE IMPORTANCE OF FUEL CONSERVATION GROWS, THE COMPROMISE BETWEEN AERODYNAMICS AND OTHER FUNCTIONAL OR COSMETIC REQUIREMENTS WILL BE BENT TOWARDS ACHIEVING THE LOWEST POSSIBLE DRAG COEFFICIENTS. WITH THE POSSIBILITY OF FUEL ECONOMY REGULATIONS IN THE NEXT FEW YEARS, THERE IS NO CHOICE BUT TO CUT HUNDREDS OF POUNDS OF WEIGHT OUT OF THE MAJORITY OF NEW CARS. BARRING SIGNIFICANT BREAKTHROUGHS IN BASIC ENGINE DESIGN, THE ONLY THREE WAYS THAT SUCH CUTS CAN BE MADE ARE AS FOLLOWS: BY DESIGNING ALL-NEW CARS TO A SMALLER SIZE, BY TOTAL DETAIL DESIGN REFINEMENT IN NEW VEHICLES FOR WEIGHT REDUCTION, AND BY ELIMINATING NON-

CRITICAL COMPONENTS CURRENTLY FITTED IN CONVENTIONAL FORMS AND CHANGING TO LIGHTER MATERIALS. IT IS INEVITABLE THAT ALMOST EVERYONE WILL FOLLOW A LITTLE OF ALL THREE COURSES. THERE IS ALSO CERTAINLY MUCH IMPROVEMENT TO COME WITHIN THE CONSTRAINTS OF MEETING ACCIDENT IMPACT ABSORPTION REQUIREMENTS. IT WAS THE NEED FOR IMPACT ABSORPTION WHICH REALLY ASSURED THE CONTINUING DOMINANCE OF SHEET STEEL AS RAW MATERIAL FOR HIGH-VOLUME BODYSHELL STRUCTURAL AREAS. WITH STEEL REMAINING AS THE MAJOR STRUCTURAL BODY MATERIAL, THE QUESTION OF CORROSION RESISTANCE REMAINS AND THE TREND FOR FEWER SURFACE WATER TRAPS, DIFFICULT-TO-PAINT EDGES, ETC., IS EXPECTED TO CONTINUE IN THE DESIGN OF VISIBLE SURFACE PANELS. WITH TOTAL PRODUCTION CAPACITY BEGINNING TO RUN AHEAD OF MARKET REQUIREMENTS IN MANY AREAS, THE INTENSIFYING PRESSURE ON DESIGNERS TO COME UP WITH A MORE ATTRACTIVE PRODUCT, COUPLED WITH THE INCREASINGLY SOPHISTICATED TASTES OF EUROPEAN BUYERS, WILL LEAD TO SOME VERY INTERESTING DEVELOPMENTS IN PAINT COLORS, TRIM, AND GRAPHICS. WITH RESPECT TO THE VEHICLE INTERIOR, THE MATERIALS AVAILABLE AND METHODS OF MANUFACTURE PECULIAR TO THEM WILL ALWAYS GOVERN AESTHETICS, AND SAFETY WILL PLAY AN INCREASINGLY IMPORTANT ROLE, ESPECIALLY IN THE HEAD IMPACT AREAS.

by DAVID BACHE  
Publ: ENGINEERING V218 N1 P28-33 (JAN 1978)  
1978  
Availability: SEE PUBLICATION

HS-023 336

#### AUTOMOBILE ENGINEERING--A SPECTATOR'S VIEW

OVER THE PAST 10 TO 15 YEARS MOST CARS HAVE BECOME BETTER THAN THEIR PREDECESSORS, BUT PROGRESS TOWARDS A LONGER LASTING AND MORE ECONOMIC-TO-OWN CAR HAS BEEN PATCHY AND THERE ARE AREAS WHICH CAN BE IMPROVED AT LITTLE COST TO THE MANUFACTURER AND THE FIRST OWNER. THERE ARE STILL TOO MANY EXAMPLES OF INDIFFERENT, UNIMAGINATIVE, OR PLAIN BAD DESIGN. SEVERAL UNITED KINGDOM MODELS ARE STILL POOR ALSO-RANS WITH RESPECT TO SOLVING THE PROBLEMS ASSOCIATED WITH THE MOUNTING OF FRONT-WHEEL DRIVE POWER UNITS HAVING CRISP, PRECISE GEAR CHANGES. APART FROM THE LIMITED WEAR CAPACITY OF THE SYNCHROMESH ITSELF, UNSATISFACTORY GEAR CHANGE QUALITY MAY BE DUE TO AN ILL-CONCEIVED LAYOUT OF GEAR SHIFT MECHANISM, PARTICULARLY WHEN CONSIDERING MOVEMENT OF THE POWER UNIT ON ITS MOUNTING AS TORQUE IS APPLIED. THE WELL KNOWN WATER INGRESS INTO THE CAR TRUCK IS ANOTHER CASE WHERE THE DESIGNERS WERE AT FAULT. THE SUMMER OF 1976 WITH ITS VERY LONG SPELL OF SUNSHINE AND HIGH RELATIVE HUMIDITY PRODUCED ENVIRONMENTAL CONDITIONS WHICH DEMONSTRATED THAT

MANY OF THE DESIGN AND MATERIALS SPECIFICATIONS FOR AUTOMOBILES ARE IN NEED OF URGENT REVIEW. INTERIOR TEMPERATURES REACHED IN CARS DURING THAT PERIOD REFLECTED THE LIMITATIONS OF SUCH MATERIALS AS HARD RUBBER, PLASTICS, AND ELASTOMERS AS WELL AS CERTAIN ADHESIVES. JACKS AND JACKING POINTS ARE OTHER POINTS OF DISSATISFACTION: IT IS NOT ALWAYS POSSIBLE TO USE THE JACK PROVIDED BY THE MANUFACTURER TO CHANGE THE PUNCTURED TIRE WITHOUT A GREAT DEAL OF TROUBLE OR INCONVENIENCE. MATERIALS PROBLEMS INCLUDE RUBBER AND ELASTOMER ELEMENTS WHICH, BY AND LARGE, HAVE TOO SHORT A SERVICE LIFE. THE EVERYDAY OPERATING ENVIRONMENT OF HEAT, OZONE AND OIL MIST, ROAD GRIT, SLUSH AND RAINWATER IS NOT STIPULATED IN MANY OF THE SPECIFICATIONS AGAINST WHICH THE SPECIALIST FIRMS SUPPLY. EACH ONE OF THESE FACTORS TENDS TO AFFECT ADVERSELY NOT ONLY THE PERFORMANCE OF THESE RUBBER ELEMENTS, BUT ALSO MUCH MORE COSTLY UNITS WHICH DEPEND ON THE PROPER PERFORMANCE OF THESE ELEMENTS. NYLON, IMPREGNATED WITH ADDITIONAL SOLID LUBRICANTS AND APPLIED TO THE GREASING OF KNUCKLE JOINTS ON STEERING AND SOME SUSPENSION LINKAGES, HAS HAD A VERY SHORT SERVICE LIFE IN TOO MANY INSTANCES.

by MARCUS JACOBSON

Publ: ENGINEERING V218 N1 P34-7 (JAN 1978)

1978

Availability: SEE PUBLICATION

HS-023 337

### **MORE MPG [MILES PER GALLON] FROM THOSE NEW SUPER-SLIPPERY OILS**

TWO NEW LOW-FRICTION PETROLEUM-BASED OILS ON THE MARKET, ATLANTIC RICHFIELD'S ARCOGRAPHITE AND EXXON'S NEW UNIFLO, CLAIM TO GIVE IMPROVED GAS MILEAGE. BOTH OF THESE CRANKCASE LUBRICANTS CONTAIN A "SLIPPERINESS" AGENT, AN INGREDIENT DESIGNED TO REDUCE FRICTION BETWEEN MOVING PARTS OF AN AUTOMOBILE ENGINE, WHICH CUTS DOWN ON THE AMOUNT OF GAS AN ENGINE MUST CONSUME JUST TO OVERCOME ITS OWN INTERNAL FRICTION AND THUS GIVING MORE MILES FROM EVERY TANK OF GAS. BUT WHILE BOTH OF THE LUBRICANTS OPERATE ON THE SAME PRINCIPLE OF ADDING FRICTION MODIFIERS TO PETROLEUM-BASED OILS, THE COMPANIES CHOSE ENTIRELY DIFFERENT ADDITIVES. THE ARCO OIL SCIENTISTS HAVE NOW APPARENTLY SOLVED THE PROBLEM OF THE SETTLING OUT OF GRAPHITE WHEN IT IS ADDED TO AN ENGINE OIL. THE TRICK IS DISPERSION, OR GETTING THE PARTICLES OF GRAPHITE PERMANENTLY SUSPENDED IN THE OIL. THE WAY THIS IS ACHIEVED INVOLVES AN AVERAGE PARTICLE-SIZE DISTRIBUTION OF ABOUT FOUR TENTHS OF A MICRON, AND A DISPERSING AID IN THE PRODUCT THAT KEEPS THE PARTICLES PERMANENTLY IN SUSPENSION. EACH GRAPHITE PARTICLE FORMS A MICELLE (I.E. A PARTICLE IN A COLLOIDAL NUCLEUS SURROUNDED BY IONS); THE GRAPHITE

PARTICLE IS ENCAPSULATED BY A MATERIAL THAT HAS AN AFFINITY FOR THE PARTICLE ITSELF AND ALSO AN AFFINITY FOR THE MATERIAL IN WHICH THE PARTICLE IS DISPERSED. THERE ARE NO PROBLEMS WITH THE FILTERING OUT OF THE GRAPHITE OR THE BUILD-UP OF GRAPHITE DEPOSITS. EXXON USES A CHEMICAL FRICTION MODIFIER WHICH IS REPORTED TO BE OF THE CLASS OF MATERIALS CALLED SULFURIZED OLEATES. THEY HAVE CHARACTERISTICS THAT GIVE THEM HIGH AFFINITIES FOR METAL SURFACES, WHICH MAY CAUSE ABSORPTION ON THE SURFACE OR, IN SOME CASES, ACTUAL CHEMICAL BONDING MAY EVEN OCCUR. THE PRECISE MECHANISM IS NOT TOTALLY UNDERSTOOD, BUT SOME SORT OF PLATING ACTION SEEMS TO OCCUR. ONE ADVANTAGE OF THIS TYPE OF SLIPPERINESS AGENT OVER GRAPHITE IS ITS OIL SOLUBILITY. EACH OF THESE ENGINE LUBRICANTS HAS BEEN EXTENSIVELY TESTED IN MIXED-CAR FLEETS AND IN THE ENGINE LABS TO ASSURE THAT IN ADDITION TO IMPROVING MILEAGE (4.8% AVERAGE GAIN IN GAS MILEAGE FOR ARCOGRAPHITE AND 4.5% FOR UNIFLO), THEY MEET OR SURPASS THE STANDARD TESTS FOR SE GRADE OILS. ARCO IS OPENLY CLAIMING THAT ARCOGRAPHITE REDUCES ENGINE WEAR AS WELL, WHILE EXXON HAS SEEN SUCH AN IMPROVEMENT WITH UNIFLO BUT IS NOT READY TO MAKE A SIMILAR CLAIM. BOTH SYNTHETICS AND THE NEW LOW-FRICTION PETROLEUM OILS HAVE THEIR OWN MERITS. AND GIVEN THE COST SPREAD BETWEEN THEM (\$1.50 FOR NEW OILS VS. \$5.00 FOR SYNTHETICS), THERE SEEMS TO BE ROOM FOR, AND RUMORS OF, BLENDING THE TWO.

by E. F. LINDSLEY

Publ: POPULAR SCIENCE V212 N5 P46, 48-50, 176 (MAY 1978)

1978

Availability: SEE PUBLICATION

HS-023 338

### **SPEEDERS WARNED: SLOW DOWN OR ELSE**

EFFORTS TO ENFORCE, AND THE IMPORTANCE OF DRIVER COMPLIANCE WITH, THE 55 MPH SPEED LIMIT, WITH PARTICULAR REFERENCE TO THE STATE OF CALIFORNIA, ARE DISCUSSED. ON 24 JAN 1978, PRESIDENT CARTER ASKED CONGRESS FOR \$40 MILLION TO AID THE STATES IN A CRACKDOWN ON MOTORISTS WHO CONTINUE TO DEFY THE SPEED LAW. THIS MONEY, THE PRESIDENT POINTED OUT, WILL BE SPENT TO HIRE MORE TRAFFIC OFFICERS AND TO PROVIDE RADAR EQUIPMENT TO ASSIST THE PATROL PERSONS IN KEEPING A CLOSER WATCH OVER THE NATION'S 131 MILLION DRIVERS. RESEARCH, HE SAID, SHOWS THAT FULL COMPLIANCE WITH THE LAW WOULD SAVE 5000 LIVES AND APPROXIMATELY 3 BILLION GALLONS OF GASOLINE A YEAR. WHILE VARIOUS POLLS AND SURVEYS INDICATE THAT A MAJORITY OF AMERICANS APPROVE OF THE 55 MPH LIMIT, A LATE STUDY BY THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION (NHTSA) DISCLOSED THAT THE AVERAGE HIGHWAY SPEED WAS 61 MPH. IN CALIFORNIA, APPROXIMATELY 85% OF THE

HIGHWAY DRIVERS WERE FOUND TO BE VIOLATING THE 55 MPH RATE BY NEARLY THE SAME MARGIN. CALIFORNIA IS ONE OF FOUR STATES THAT HAVE NOT SUPPLIED THEIR PATROL PERSONS WITH THE USE OF RADAR, A NECESSITY IN AN ATTEMPT TO CATCH SPEEDERS. THE \$40 MILLION PROPOSAL FOR FUNDS TO HELP STOP SPEEDING MAY CHANGE THE PICTURE. IN ANY CASE, THE MESSAGE IS CLEAR; SPEEDING IS GOING TO BE MADE LESS POPULAR IN 1978 BOTH BY MORE CITATIONS AND POSSIBLY HEAVIER FINES. AN EXAMPLE OF A NEW MEANS TO REDUCE SPEEDING IS AN INEXPENSIVE DEVICE THAT TRICKS RADAR DETECTORS OR "FUZZ BUSTERS" WHICH HAS BEEN INVENTED BY A SALT LAKE CITY RADIO REPAIRMAN AND WHOSE DEVELOPMENT IS BEING SUPPORTED BY THE DEPT. OF TRANSPORTATION. THIS INVENTION WILL ENABLE OFFICIALS TO SLOW DOWN SPEEDERS WHO HAVE RADAR DETECTORS, SINCE THE DEVICE WILL CAUSE THEM TO THINK THEY ARE BEING SCREENED AND CLOCKED BY RADAR. SEVERAL CALIFORNIA CITIES HAVE INITIATED RADAR PATROL UNDER A THREE-YEAR FEDERAL PROGRAM, AND RESULTS HAVE DEMONSTRATED THAT THE USE OF RADAR HAS NOT ONLY DECREASED THE NUMBER OF ACCIDENTS, BUT ALSO THE NUMBER OF TRAFFIC FATALITIES. ONE CANNOT EXPECT MOTORISTS TO DISPLAY SELFDISCIPLINE AND SLOW DOWN UNLESS THERE IS A STRONG HIGHWAY PATROL FORCE WITH ALL OF THE NECESSARY EQUIPMENT TO DO THE JOB AND AN EFFECTIVE, NATIONAL EDUCATION CAMPAIGN TO CONVINCE THE NATION'S MOTORISTS THAT THE ENERGY CRISIS IS REAL.

by WILLIAM L. ROPER

Publ: CALIFORNIA HIGHWAY PATROLMAN V42 N4 P6-7, 28-9, 32-3, 36-7 (JUN 1978)  
1978

Availability: SEE PUBLICATION

HS-023 339

#### **MM [MILLIMETER WAVEBAND] RADAR FOR HIGHWAY COLLISION AVOIDANCE**

A 36 GHZ AUTOMATIC/NONCOOPERATIVE RADAR BRAKING SYSTEM HAS BEEN DEVELOPED WHICH IS SIZE COMPATIBLE WITH COMPACT CARS. THIS HIGHWAY COLLISION AVOIDANCE SYSTEM CAN BE A TOOL IN PREVENTING AND REDUCING THE SEVERITY OF ACCIDENTS CAUSED BY INATTENTIVE OR SLOW RESPONDING DRIVERS. DISCRIMINATION AGAINST FALSE TARGETS IS ACCOMPLISHED BY USING A NARROW ANTENNA BEAM (2.5° TO 4°) AND LIMITING THE RANGE AT WHICH BRAKES ARE APPLIED (250-FOOT RANGE CUTOFF). THIS RADAR SYSTEM IS NOT INTENDED TO BE A PRODUCTION TYPE SYSTEM, BUT RATHER A SYSTEM WITH WHICH THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION (NHTSA) WILL CONDUCT A COMPREHENSIVE TEST PROGRAM. IDEALLY A RADAR BRAKE SYSTEM WOULD PREVENT ALL FRONTAL COLLISIONS. ALTHOUGH THIS SYSTEM WILL NOT COMPLETELY SATISFY THIS GOAL, IT WILL BE AN EFFECTIVE ADJUNCT TO SAFETY BY MITIGATING IMPACT VELOCITY IN MANY SITUATIONS, THEREBY

REDUCING INJURY SEVERITY AND SAVING LIVES. IN LOWER SPEED ENCOUNTERS, COLLISIONS WILL STILL BE ENTIRELY AVOIDED BY THE SYSTEM AS PRESENTLY ENVISIONED.

by YUNG-KUANG WU; CARL P. TRESSELT  
DOT-HS-4-00913

Publ: MICROWAVE JOURNAL P39-42, 59 (NOV 1977)  
1977; 8REFS

THIS PAPER PRESENTS RESULTS OF A STUDY PERFORMED BY BENDIX CORP.

Availability: SEE PUBLICATION

HS-023 340

#### **AUTOMOBILE ENGINE CONTROL PARAMETERS STUDY. VOL. 1: SUMMARY AND STATUS OF DOMESTIC ENGINE CONTROL PRACTICES. FINAL REPORT**

A TOTAL OF 28 DOMESTIC AND FOREIGN SPARK IGNITION AUTOMOBILE ENGINES IN THE 40 TO 150 HP RANGE WERE EXAMINED, FROM EARLY EMISSION CONTROL YEARS THROUGH THE 1976 MODEL YEAR, IN ORDER TO EVALUATE AUTOMOBILE ENGINE CONTROL PARAMETERS AND THEIR EFFECTS ON VEHICLE FUEL ECONOMY AND EMISSIONS. THE CONTROL DEVICES AND TECHNIQUES EXAMINED INCLUDE ENGINE MODIFICATIONS, CARBURETOR, FUEL INJECTION, INTAKE SYSTEM, IGNITION SYSTEM, EXHAUST GAS RECIRCULATION AND EXHAUST AFTERTREATMENT. A BRIEF SYNOPSIS IS GIVEN OF STUDY FINDINGS, HIGHLIGHTING THE SIGNIFICANT FEATURES AND EFFECTS OF EACH CONTROL TECHNIQUE EXAMINED, AS WELL AS A REVIEW OF THE DESIGN FEATURES AND OPERATIONAL CHARACTERISTICS OF THE ENGINE CONTROL APPROACHES EMPLOYED BY THE DOMESTIC AND FOREIGN AUTOMOBILE INDUSTRY, AND A DETAILED EXAMINATION OF THE CONTROL TECHNIQUES IN THE SELECTED DOMESTIC ENGINES. THE SELECTED DOMESTIC ENGINES STUDIED INCLUDE THOSE MANUFACTURED BY AMERICAN MOTORS CORP., CHRYSLER CORP., FORD MOTOR CO., AND GENERAL MOTORS CORP. ON BALANCE, THE FUEL ECONOMY IMPROVEMENT OF THE IMPORTED AUTOMOBILES BETWEEN 1974 AND 1976 IS LESS THAN THAT OF THE DOMESTIC VEHICLES, BECAUSE OF THEIR SMALLER SIZE, WHICH PERMITS THE USE OF LESS SOPHISTICATED EMISSION CONTROL SYSTEMS. SINCE IMPORTED CARS HAVE HISTORICALLY HAD A FUEL ECONOMY ADVANTAGE OVER THEIR DOMESTIC COUNTERPARTS, THERE HAS BEEN LESS INCENTIVE TO USE SOPHISTICATED CONTROL SYSTEMS AND TO APPLY EXTENSIVE SYSTEM OPTIMIZATION PROCEDURES. ON AN INDIVIDUAL ENGINE BASIS, TRACKING THE YEAR-TO-YEAR CHANGES IN CONTROL SYSTEM MODIFICATIONS AND TECHNIQUES PROVIDES VALUABLE INSIGHT INTO THE RELATIONSHIPS BETWEEN CONTROL SYSTEM SETTINGS, FUEL ECONOMY, AND EMISSIONS. ON AN OVERALL BASIS, THE INHERENT DIFFERENCES BETWEEN THE VARIOUS ENGINE

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DESIGNS DO NOT PERMIT OTHER THAN GENERAL OBSERVATIONS.

by W. U. ROESSLER; R. R. COVEY; A. MURASZEW  
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TSC-FO4701-76-C-0077  
Rept. No. DOT-TSC-OST-76-56.I; 1977; 286P REFS  
REPT. FOR JUN 1975-FEB 1977. VOL. 2 IS HS-023 341.  
Availability: NTIS

HS-023 341

# **AUTOMOBILE ENGINE CONTROL PARAMETERS STUDY. VOL. 2: STATUS OF FOREIGN ENGINE CONTROL PRACTICES. FINAL REPORT**

AUTOMOBILE ENGINE CONTROL PARAMETERS AND THEIR EFFECTS ON VEHICLE FUEL ECONOMY AND EMISSIONS ARE EVALUATED FOR SELECTED FOREIGN MOTOR VEHICLES (AUDI, BMW, BRITISH LEYLAND, FIAT, MERCEDES-BENZ, NISSAN, PEUGEOT, SAAB, TOYOTA, VOLKSWAGEN AND VOLVO). THE PRINCIPAL TOPICS REVIEWED FOR THE SELECTED ENGINES ARE ENGINE DESIGN MODIFICATIONS, INTAKE SYSTEM, CARBURETION, IGNITION SYSTEM, EMISSION CONTROL DEVICES, AND FUEL ECONOMY EFFECTS.

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TSC-FO4701-76-C-0077  
Rept. No. DOT-TSC-OST-76-56.II; 1977; 190P 95REFS  
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Availability: NTIS

HS-023 343

# **THE EFFECTIVENESS OF AN AT-HOME DRIVERS LICENSING LAW TEST. AN EVALUATION OF THE GOOD DRIVER COMPONENT OF CALIFORNIA'S SELECTIVE TESTING PROGRAM**

THE FIRST PILOT PROJECT CONDUCTED BY THE CALIFORNIA DEPT. OF MOTOR VEHICLES (DMV) TO EVALUATE THE CONCEPT OF SELECTIVE TESTING OF DRIVER'S LICENSE APPLICANTS IS REPORTED. THROUGH PASSAGE OF SENATE BILL 1301 IN 1973, THE CALIFORNIA LEGISLATURE AMENDED VEHICLE CODE SECTION 12814 TO ALLOW DMV SELECTIVELY TO TEST DRIVER'S LICENSE APPLICANTS ACCORDING TO THE QUALITY OF THEIR PRIOR DRIVING RECORD OR OTHER CONDITIONS THAT MIGHT AFFECT THEIR ABILITY TO DRIVE SAFELY. CURRENTLY, APPLICANTS ARE REQUIRED TO TAKE A WRITTEN LAW TEST WHEN THEY RENEW THEIR LICENSE EVERY FOUR YEARS. IN THIS PILOT STUDY, THOSE WITH NO ACCIDENTS OR CONVICTIONS WITHIN THE PAST THREE YEARS WERE SENT A PAMPHLET SELFTEST, A SHEET WITH THE ANSWERS, AND A NOTICE TO RENEW THEIR DRIVER'S LICENSE (SPECIALLY CODED). WHEN THEY PRESENTED THE RENEWAL NOTICE AT THE FIELD OFFICE, THEIR REGULAR WRITTEN TEST WAS WAIVED. THOSE WITH ONE ACCIDENT OR ONE CONVICTION DURING THE PAST THREE YEARS WERE

HSL 78-12

SENT A PAMPHLET TEST, A SHEET ON WHICH TO MARK THEIR ANSWERS, AND A RENEWAL NOTICE. WHEN THEY PRESENTED THE ANSWER SHEET AND RENEWAL NOTICE, THEIR REGULAR WRITTEN TEST WAS WAIVED. CONTROL GROUPS COMPRISED OF SIMILAR DRIVERS RECEIVING THE DMV'S REGULAR WRITTEN TEST WERE INCLUDED IN THE STUDY TO PROVIDE A COMPARISON BASELINE. THERE WERE NO SIGNIFICANT DIFFERENCES OVERALL BETWEEN THE CONTROL AND TREATMENT GROUPS WITH RESPECT TO REDUCTION OF ACCIDENTS AND CONVICTIONS. FOR VARIOUS SUBGROUPS THE EFFECTS OF THE NEW PROGRAM TENDED TO INCREASE ACCIDENTS AND CONVICTIONS. ALTHOUGH THE NEW EXPERIMENTAL PROGRAMS COST LESS OPERATIONALLY, THE COST OF THE INCREASED ACCIDENTS WOULD BE GREATER THAN THE OPERATIONAL SAVINGS. SINCE THE NEW AT-HOME TESTS WERE NOT COST EFFECTIVE COMPARED TO THE PRESENT FIELD TESTING, IT IS RECOMMENDED THAT THEY NOT BE IMPLEMENTED.

by DAVID M. HARRINGTON; MICHAEL RATZ  
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DEVEL. SECTION, SACRAMENTO, CALIF.  
Rept. No. CAL-DMV-RSS-77-60; 1978; 21P 7REFS  
Availability: CORPORATE AUTHOR

HS-023 345

# **MATCHING CB [CITIZENS BAND] EQUIPMENT TO THE VEHICLE ENVIRONMENT**

THE DESIGN OF A CITIZENS BAND (CB) RADIO SYSTEM FOR A VEHICLE IS A SERIES OF COMPROMISES DUE TO THE INTERACTION BETWEEN THE RADIO EQUIPMENT AND ITS ENVIRONMENT. THE DESIGNER OF THE CB RADIO EQUIPMENT AND THE DESIGNER OF THE SYSTEM, WHETHER VEHICLE MANUFACTURER OR INSTALLER, SHARE A RESPONSIBILITY TO CONSIDER THESE INTERACTIVE EFFECTS TO ASSURE MAXIMUM OPERATOR ACCEPTANCE. A DISCUSSION IS PRESENTED OF THE INTERACTIVE EFFECTS OF THE ATMOSPHERIC ENVIRONMENT, MECHANICAL CONSIDERATIONS, VEHICLE POWER SUPPLY, ELECTRICAL TRANSIENTS, EQUIPMENT SECURITY, OPERATOR INTERFACE, ELECTROMAGNETIC RADIATION, AND LEGISLATION UPON THE DESIGN OF CB RECEIVERS AND THEIR INSTALLATION IN THE VEHICLE.

by HUGO KORN  
MOTOROLA, INC., AUTOMOTIVE PRODUCTS DIV.  
Rept. No. SAE-770319; 1977; 8P 6REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 346

# **HOW MUCH IS TOO MUCH? A STUDY OF "PROBLEM CONSUMPTION" AS RELATED TO ALCOHOL AND HUMAN SAFETY**

IN THE FIRST OF A THREE-PART SERIES ON THE PREVENTION OF ALCOHOL-RELATED TRAFFIC AC-

CIDENTS, A 1972 STUDY BY THE HWY. SAFETY FOUNDATION OF MANSFIELD, OHIO IS REVIEWED. THE MANSFIELD GROUP SOUGHT TO DETERMINE WAYS TO REDUCE WHAT THEY TERMED "PROBLEM CONSUMPTION" OF ALCOHOL, WHICH THEY DEFINED AS "THE SOCIAL MECHANISM FOSTERING ALCOHOL ABUSE WITH RESPECT TO SUBSEQUENT HIGHWAY ACTIVITIES." AN INITIAL TELEPHONE SURVEY OF DRINKERS IN THE POPULATION AT LARGE (28 DRIVERS ACKNOWLEDGING THE OCCASIONAL USE OF ALCOHOLIC BEVERAGES, 20 DRIVERS CLAIMING TO BE NONDRINKERS) SHOWED THE FOLLOWING RESULTS: UNAWARENESS BY MOST DRIVERS THAT BLOOD ALCOHOL MEASUREMENTS ARE USED IN CONJUNCTION WITH DRINKING AND DRIVING, ALSO IGNORANCE OF THE SPECIFIC PRESUMPTIVE .10% BAC (BLOOD ALCOHOL CONTENT) CRITERION; INABILITY OF MOST DRINKERS TO CORRELATE CONSUMPTION OF ALCOHOL WITH ATTAINING A .10% BAC; IDEA BY MOST DRIVERS OF A PERSONAL SAFE CONSUMPTION QUANTITY AS AN AMOUNT THAT, OVER A SPECIFIED TIME PERIOD, THEORETICALLY WOULD NOT PRODUCE A .10% BAC; AND ASSOCIATION BY MOST DRINKERS OF A .10% BAC AS INDICATIVE OF VERY LIGHT DRINKING TO THE EXTENT THAT THEY JUDGE THEIR OWN SAFE CONSUMPTION QUANTITY AS AN AMOUNT GREATER THAN THEY BELIEVE IS NECESSARY TO REACH .10% BAC. A SURVEY OF 11 BARTENDERS IN THE MANSFIELD AREA SUGGESTED THAT PEOPLE WHO SERVE ALCOHOLIC BEVERAGES ARE NOT ANY BETTER EDUCATED AS TO THE .10% BAC CRITERION AND THE CONSUMPTION REQUIRED TO ACHIEVE IT. A THIRD SURVEY SHOWED THAT EVEN DRIVERS WHO ALREADY HAVE INCURRED AT LEAST ONE CONVICTION OF DWI (DRIVING WHILE INTOXICATED) ARE NOT ANY MORE KNOWLEDGEABLE ON THE SUBJECT. IN ANOTHER EXPERIMENT, 75% OF DRINKERS (FIVE COUPLES) IN A PARTY ENVIRONMENT INDICATED SAFE CONSUMPTION QUANTITIES THAT PRODUCED ACTUAL BAC MEASUREMENTS EQUAL TO, OR HIGHER THAN, .10%. IN THE SURVEY GROUPS, THE MAJORITY OF DRINKERS CITED SAFE CONSUMPTION QUANTITIES THAT WOULD HAVE RESULTED IN BAC'S LESS THAN .10%. IN ANOTHER PART OF THE STUDY, RESEARCHERS WERE SENT TO BARS WITH THE OBJECTIVE OF DETERMINING HOW MANY DRINKS THEY COULD OBTAIN BEFORE THEIR SERVICE WOULD BE TERMINATED BY THE BARTENDER. FIVE DIFFERENT BARROOM EPISODES WELL ILLUSTRATED THE LACK OF ANY MEANINGFUL ATTEMPT TO CONTROL THE SUPPLY OF ALCOHOLIC BEVERAGES.

Publ: BOTTOM LINE V1 N4 P24-9, 32 (WINTER 1977)  
1977; 1REF  
Availability: SEE PUBLICATION

HS-023 347

#### **DRIVING RECORD AND RECIDIVISM FOLLOWING THE PURGING OF DRIVER CONTROL ACTION FILES. FINAL REPORT**

CALIFORNIA DRIVERS WHO HAD DRIVER CONTROL ACTION (LEGAL) FILES ESTABLISHED AT THE DEPT. OF MOTOR VEHICLES (DMV) AND SUBSEQUENTLY

PURGED WERE SELECTED FOR AN ANALYSIS OF DRIVING RECORDS AND RECIDIVISM (FURTHER LEGAL ACTIONS). LEGAL FILES GENERALLY REPRESENT DRIVERS WITH DEVIANT RECORDS WHO HAVE HAD ACTIONS TAKEN AGAINST THEIR DRIVING PRIVILEGE BY THE DMV. SINCE A CONTINUED DEVIANT DRIVING RECORD PREVENTS LEGAL FILE PURGING, FILES THAT ARE PURGED NECESSARILY REPRESENT DRIVERS WHOSE DRIVING RECORDS HAVE SUBSTANTIALLY IMPROVED. THE LEGAL FILE DRIVERS WERE COMPARED TO A SAMPLE OF RENEWAL APPLICANTS TO DETERMINE IF THE LEGAL FILE DRIVING RECORDS DEVIATED FROM THOSE OF AN AVERAGE SAMPLE OF CALIFORNIA DRIVERS. AN ANALYSIS OF SUBSEQUENT DRIVING RECORDS SHOWED THAT LEGAL FILE DRIVERS HAD SOMEWHAT HIGHER RATES OF ACCIDENTS AND CONVICTIONS THAN WERE ESTIMATED FOR THE RENEWAL APPLICANTS. THE LEGAL FILE DRIVERS HAD A HIGHER RATE OF SUBSEQUENT DEPARTMENT ACTIONS THAN AVERAGE FOR CALIFORNIA DRIVERS. AS EXPECTED, THE LEGAL FILE SAMPLE HAD SUBSTANTIALLY IMPROVED DRIVING RECORDS COMPARED TO THEIR PRIOR RECORDS. THE LEGAL FILE SUBSEQUENT DRIVING RECORDS WERE NOT DEVIANT ENOUGH TO NECESSITATE MORE STRINGENT PURGE CRITERIA. HOWEVER, THE TRENDS TOWARD A HIGHER THAN AVERAGE RECIDIVISM INDICATE THAT CURRENT PURGE CRITERIA SHOULD NOT BE RELAXED.

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Rept. No. PB-267 757; CAL-DMV-RSS-56-76; 1976; 17P  
Availability: NTIS

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#### **VARIABLE MESSAGE SIGNING FOR TRAFFIC SURVEILLANCE AND CONTROL. A STATE OF THE ART REPORT. FINAL REPORT**

THE FOUR BASIC COMPONENTS OF A VARIABLE MESSAGE SIGNING (VMS) SYSTEM FOR TRAFFIC CONTROL APPLICATIONS ARE DISPLAY, CONTROL SYSTEM, SYSTEM INTERCONNECT, AND HIGHWAY SURVEILLANCE SYSTEM. VMS IS TYPICALLY USED FOR LANE CONTROL, TRAFFIC ADVISORY, AND ALTERNATE ROUTING APPLICATIONS; ITS USAGE IS INCREASING ANNUALLY. NINE VMS DISPLAY TYPES ARE PRESENTED: FLAP, SCROLL, DRUM, INERT GAS (NEON), FIBER OPTICS, LIGHT BULB MATRIX, ELECTROMECHANICAL FLAP MATRIX, ELECTROSTATIC VANE MATRIX, AND ELECTROMAGNETIC DISK MATRIX. FOR EACH DISPLAY TYPE ITS FUNCTIONAL CHARACTERISTICS, MANUFACTURERS, OPERATIONAL EXPERIENCES, AND CURRENTLY AVAILABLE PUBLICATIONS ARE PRESENTED. CONTROL SYSTEMS FOR ALL VMS DISPLAYS FALL INTO THREE GENERAL CATEGORIES, THE FIRST CONTROLLING A SET NUMBER OF FIXED-CHARACTER MESSAGES LOCATED EITHER ON OR IN THE SIGN, THE SECOND CONTROLLING MESSAGES THAT ARE EITHER STORED OR COMPOSED AT THE SIGN'S CONTROL TERMINAL, AND THIRD, A VARIATION OF THESE

TWO. THREE OPTIONS ARE AVAILABLE TO INTERCONNECT A VMS DISPLAY WITH A REMOTE TERMINAL (VIA RADIO FREQUENCY TELEMETRY LINK, LEASED TELEPHONE LINES, OR HARDWIRED CABLE). TO ENSURE THAT CREDIBLE AND TIMELY INFORMATION IS PRESENTED ON A REMOTELY CONTROLLED MULTIMESSAGE DISPLAY, A SYSTEM OF HIGHWAY SURVEILLANCE IS NEEDED: SIGN OPERATORS OR INDEPENDENT SYSTEMS SUCH AS TIME CLOCKS, INCLEMENT WEATHER DETECTION DEVICES, AND TRAFFIC SURVEILLANCE AND CONTROL SYSTEMS VIA VEHICLE DETECTION. AREAS OF INTENSIVE VMS RESEARCH ARE THE HUMAN FACTORS ELEMENT WHICH DEALS WITH STUDIES ON MESSAGE CONTENT, PRESENTATION AND EFFECTIVENESS, AND NEW OR INNOVATIVE TECHNOLOGY (PRODUCT LINE UPDATES, PROMISING DISPLAY TECHNOLOGY SUCH AS LIGHT EMITTING DIODES, LIQUID CRYSTAL DISPLAYS AND FIBER OPTICS, AND NEW DISPLAY TYPES SUCH AS TOTALLY VARIABLE FIBER OPTICS DISPLAY, VARIABLE REPROGRAMMABLE ROLLER TYPE DISPLAY, TOTALLY VARIABLE "TELEMATRIX" DISPLAY, AND TOTALLY VARIABLE "UNEX" DISPLAY). A TRADEOFF ANALYSIS SHOULD INCLUDE CONSIDERATION OF PURPOSE OR PROBLEM, AMOUNT OF ROADWAY TO BE COVERED, AS WELL AS PLACEMENT AND EXPANSION, TYPES AND MODES OF MESSAGES REQUIRED, HIGHWAY SURVEILLANCE CURRENTLY AVAILABLE, LEASED TELEPHONE LINES VS. HARDWIRING SIGNS, POWER CONSUMPTION TRADEOFF, AND OVERALL VMS SYSTEM COSTS. APPENDICES LIST CURRENT VMS MANUFACTURERS, AND COVER SELECTING AND OPERATING LAMPS IN MATRIX TYPE DISPLAYS, ESTIMATING OPERATING COSTS OF LAMP MATRIX HIGHWAY SIGNS, AND MATRIX VMS COMPARISONS.

by WARREN DORSEY  
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AND DEVEL., WASHINGTON, D.C. 20590  
Rept. No. FHWA-RD-77-98; 1977; 139P 25REFS  
REPT. FOR OCT 1975-JAN 1977.  
Availability: NTIS

HS-023 349

### PROBABILITY MODELS FOR ANALYZING THE EFFECTS OF BIORHYTHMS ON ACCIDENT OCCURRENCE

THE BIORHYTHM THEORY IS EXAMINED FROM A THEORETICAL PROBABILITY POINT OF VIEW, AND A METHOD IS PROVIDED FOR DETERMINING CRITICAL DAYS AND COMPARING EXPECTED AND ACTUAL RESULTS WHEN THE BIORHYTHM THEORY IS APPLIED. THE BIORHYTHM THEORY PURPORTS THAT THERE ARE THREE CYCLES IN HUMAN BEINGS: A 23-DAY PHYSICAL CYCLE, A 28-DAY EMOTIONAL CYCLE, AND A 33-DAY INTELLECTUAL CYCLE. THESE CYCLES ARE FUNDAMENTAL TO LIFE, EXACTLY REGULAR, AND INVOLUNTARILY FLUCTUANT FROM POSITIVE STATES IN THE FIRST HALF OF THE CYCLE TO NEGATIVE STATES IN THE SECOND HALF. THE DAYS ON WHICH TRANSITION FROM ONE STATE TO THE OTHER OCCURS ARE TERMED CRITICAL DAYS, AND IT HAS BEEN REPORTED THAT SAFETY AND PERFORMANCE MAY

SUFFER AT THESE DAYS IN THE CYCLES. SEVERAL APPLICATIONS OF THIS THEORY IN THE AREAS OF ACCIDENT PREVENTION AND HUMAN PERFORMANCE HAVE BEEN SUGGESTED BY OTHER RESEARCHERS. THE IMPLICATIONS FOR ANALYSIS OF SEVERAL DIFFERENT DEFINITIONS OF CRITICAL DAYS ARE NOTED IN THIS STUDY, ESPECIALLY WITH REGARD TO CHANGES IN THE PROBABILITIES USED FOR CALCULATIONS. THE MAJOR CONCLUSION IS THAT ATTEMPTS TO VALIDATE BIORHYTHM THEORY SHOULD BE BASED ON STATISTICAL COMPARISON OF OBSERVED CYCLE POSITION FREQUENCY WITH FREQUENCIES THAT WOULD BE EXPECTED IF THERE WERE NO BIORHYTHM EFFECT. ALTHOUGH THE CHOICE OF CRITICAL DAY DEFINITION IS UP TO THE INDIVIDUAL RESEARCHER, IT IS RECOMMENDED THAT FIRST CONSIDERATION BE GIVEN TO DEFINITION 1 (ZERO-CROSSING DAYS ONLY) WHEN TIME OF BIRTH IS KNOWN, AND TO DEFINITION 3 (NOON CROSSING DAYS AND DAYS BEFORE AND AFTER MIDNIGHT CROSSING) WHEN TIME OF BIRTH IS NOT KNOWN. THIS RECOMMENDATION IS BASED ON COMPUTATIONAL CONVENIENCE AND CONSISTENCY WITH CURRENT BIORHYTHM THEORY. REGARDLESS OF THE DEFINITION ADOPTED, BOTH ACTUAL AND EXPECTED FREQUENCIES SHOULD BE CALCULATED ON THE SAME BASIS. USE OF THE METHOD IN ANALYZING ACTUAL ACCIDENT DATA (63 FEDERAL AVIATION ADMINISTRATION AIRCRAFT ACCIDENTS IN WHICH THE FAA RULED THAT PILOT ERROR WAS THE CAUSE) FAILED TO SUPPORT CURRENT BIORHYTHM THEORY. FURTHER STUDY AND VALIDATION OF THIS THEORY IS NEEDED.

by CHARLES N. KURUCZ; TAREK M. KHALIL  
Publ: JOURNAL OF SAFETY RESEARCH V9 N4 P150-8  
(DEC 1977)  
1977; 20REFS  
Availability: SEE PUBLICATION

HS-023 350

### THE POLICE PATROL CAR: ECONOMIC EFFICIENCY IN ACQUISITION, OPERATION, AND DISPOSITION

LIFE CYCLE COST TECHNIQUES, INCLUDING FIRST AND END COSTS, OPERATION AND MAINTENANCE COSTS, AND CONVERSION OF COSTS TO AN EQUIVALENT BASIS TO ACCOUNT FOR DIFFERENCES IN TIMING OF EXPENDITURES, ARE APPLIED TO EXAMINE THE COSTS OF ALTERNATIVE APPROACHES TO PATROL CAR ACQUISITION, OPERATION, MAINTENANCE, AND DISPOSITION. A DESCRIPTIVE OVERVIEW OF EXISTING POLICE FLEET PRACTICES IS PROVIDED IN A NUMBER OF TABLES ON FLEET COMPOSITION, PATROL CAR SELECTION AND ACCESSORIZATION, CAR UTILIZATION PRACTICES, MAINTENANCE, AND REPLACEMENT POLICY. INFORMATION WAS OBTAINED THROUGH INTERVIEWS AND CORRESPONDENCE WITH POLICE, MANAGERS OF COMMERCIAL FLEETS, MANUFACTURERS, DEALERS, LEASING BUSINESSES, AND AUTO AUCTION SPECIALISTS, AND THROUGH DATA AND LITERATURE REVIEW. THE RELATIVE DESIRABILITY OF OWNERSHIP AS COMPARED WITH LEASING VEHICLES WAS



EXAMINED; THE DIFFERENT TYPES OF LEASE ARRANGEMENTS DESCRIBED, AND BOTH COST AND NONCOST ADVANTAGES AND DISADVANTAGES OF LEASING IDENTIFIED. IN CONNECTION WITH LEASING AND OWNERSHIP, THE STUDY COMPARED CONTRACT MAINTENANCE OF CARS IN PRIVATE GARAGES WITH IN-HOUSE MAINTENANCE IN POLICE GARAGES. BASED ON ASSUMPTIONS REGARDING WAGE RATES, STAFFING REQUIREMENTS, AND OTHER FACTORS, A BREAK-EVEN FLEET SIZE WAS DETERMINED, AT WHICH POINT THE COST OF CONTRACTING MAINTENANCE TO PRIVATE GARAGES OR PERFORMING IT IN-HOUSE WOULD BE EQUAL. OPERATING AND MAINTENANCE COSTS FOR PATROL CARS OF DIFFERENT SIZES, AND CARS USED AT DIFFERENT LEVELS AND IN DIFFERENT ENVIRONMENTS, WERE PRESENTED AND ANALYZED FOR POSSIBILITIES OF COST REDUCTION. THE COMPARATIVE ECONOMIC EFFICIENCY OF ALTERNATIVE VEHICLE DRIVER ASSIGNMENT PLANS WAS ADDRESSED. THE TYPES OF POTENTIAL COSTS AND BENEFITS ASSOCIATED WITH A PERSONAL PATROL CAR PROGRAM WERE IDENTIFIED. A GENERAL METHOD FOR EVALUATING AND COMPARING THE COSTS OF A PERSONAL CAR PROGRAM AND A MULTISHIFT, POOL CAR PROGRAM WAS DESCRIBED. THE CASH FLOWS ASSOCIATED WITH EACH OF THE TWO VEHICLE PROGRAMS ARE ILLUSTRATED WITH REALISTIC DATA, AND THE LIFE-CYCLE COSTS OF A PERSONAL CAR PROGRAM AND A MULTISHIFT PLAN WERE COMPARED UNDER ALTERNATIVE ASSUMPTIONS. METHODS OF DETERMINING THE POINT OF OPTIMAL CAR REPLACEMENT WERE EXPLAINED AND ILLUSTRATED WITH DATA DRAWN FROM POLICE DEPARTMENTS. SELECTED VEHICLE CHARACTERISTICS WERE EXAMINED FOR THEIR DIRECTION OF IMPACT ON THE ECONOMIC LIFE OF A PATROL CAR. A BRIEF OVERVIEW OF THE LIFE-CYCLE COSTS OF A TYPICAL PATROL CAR WAS PROVIDED, WITH EACH OF THE MAIN COMPONENTS OF DIRECT CAR COSTS SHOWN AS A SHARE OF TOTAL DIRECT COSTS. THE STUDY CONCLUDED THAT THERE ARE CONSIDERABLE OPPORTUNITIES IN POLICE FLEET MANAGEMENT TO ALTER COSTS OF FLEET SERVICES.

by ROSALIE T. RUEGG  
NATIONAL BUREAU OF STANDARDS, APPLIED  
ECONOMICS PROG., WASHINGTON, D.C. 20234  
Rept. No. NBS-SP-480-15; 1978; 138P 123REFS  
A LAW ENFORCEMENT EQUIPMENT TECHNOLOGY  
REPORT. SPONSORED BY NATIONAL INST. OF LAW  
ENFORCEMENT AND CRIMINAL JUSTICE.  
Availability: GPO, STOCK NO. 003-003-01837-6 \$3.00

HS-023 351

## **HIGHWAY ASSISTANCE PROGRAMS: A HISTORICAL PERSPECTIVE**

THIS BACKGROUND PAPER REQUESTED BY THE U.S. SENATE BUDGET COM. PROVIDES A COMPREHENSIVE DESCRIPTION OF THE HISTORY OF FEDERAL SUPPORT FOR HIGHWAYS, PARTICULARLY SINCE THE 1956 LEGISLATION THAT ESTABLISHED THE HWY. TRUST FUND AND AUTHORIZED MAJOR FEDERAL ASSISTANCE FOR THE INTERSTATE HWY. PROGRAM. THE RATIONALE UNDERLYING THE

PRESENT HIGHWAY PROGRAM AND THE WAY THAT PROGRAM HAS BEEN MODIFIED OVER THE PAST TWO DECADES WILL BE IMPORTANT INGREDIENTS IN THE DEBATE OVER FUTURE HIGHWAY LEGISLATION. AUTHORIZATIONS FOR MOST FEDERAL HIGHWAY PROGRAMS EXPIRE AT THE END OF FISCAL YEAR 1978; THE MAJOR EXCEPTION IS THE INTERSTATE SYSTEM. IN ADDITION, THE HWY. TRUST FUND, THROUGH WHICH 90% OF FEDERAL ASSISTANCE TO HIGHWAY PROGRAMS IS FINANCED, IS SCHEDULED TO EXPIRE AT THE END OF FISCAL YEAR 1979. THUS, THE QUESTIONS OF NEW AUTHORIZATIONS AND FINANCING METHOD MUST BOTH BE ADDRESSED BY THE CONGRESS IN ORDER TO CONTINUE MOST HIGHWAY PROGRAMS BEYOND 1979.

by PORTER K. WHEELER  
CONGRESS OF THE UNITED STATES,  
CONGRESSIONAL BUDGET OFFICE, WASHINGTON,  
D.C.  
1978; 101P REFS  
Availability: GPO

HS-023 352

## **SAFETY EFFECTIVENESS EVALUATION OF THE NATIONAL ACCIDENT SAMPLING SYSTEM**

AT THE REQUEST OF THE SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES OF THE U.S. SENATE APPROPRIATIONS COMMITTEE, A SAFETY EFFECTIVENESS EVALUATION OF THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION'S (NHTSA) NATIONAL ACCIDENT SAMPLING SYSTEM (NASS) WAS CONDUCTED. THE STUDY WAS INITIATED IN OCT 1977, WHICH COINCIDED WITH THE FORMAL IMPLEMENTATION OF THE NASS PILOT PROGRAM. NASS, AS PROPOSED, IS A NATIONWIDE SYSTEM OF INVESTIGATIVE TEAMS WHOSE GOAL IS TO COLLECT NATIONALLY REPRESENTATIVE HIGHWAY ACCIDENT DATA IN ORDER TO ACCURATELY DETERMINE ACCIDENT TRENDS AND TO ASSESS THE IMPACT OF VEHICLE SAFETY STANDARDS. THE FUTURE OF NASS DEPENDS ON THE EXPERIENCE OBTAINED IN THE PILOT PROGRAM, THE RESULTS OF NUMEROUS SUPPORTIVE STUDIES, AND ANY SUBSEQUENT PROGRAM REVISION. CONSEQUENTLY, THIS SAFETY EFFECTIVENESS EVALUATION IS BASED ON THE NASS PROGRAM AS OF 25 JAN 1978; IF NECESSARY, NASS DEVELOPMENT WILL BE MONITORED AND EVALUATED FURTHER. THE ADEQUACY OF THE NASS OBJECTIVES AND THE POTENTIAL OF NHTSA TO FULFILL THEM WAS EXAMINED THROUGH A LITERATURE SEARCH AND TECHNICAL REVIEW OF ALL AVAILABLE REPORTS AND OTHER RELEVANT DOCUMENTATION. INTERVIEWS WERE HELD WITH KEY NHTSA STAFF, NASS CONTRACTORS, MEMBERS OF THE NASS NATIONAL REVIEW PANEL, AND OTHER PROMINENT RESEARCHERS AND OFFICIALS. IN ADDITION, AN INFORMAL SURVEY SOLICITED VOLUNTARY INPUT FROM EACH STATE GOVERNOR'S REPRESENTATIVE FOR HIGHWAY SAFETY, DEPARTMENT OF HIGHWAYS, DEPARTMENT OF MOTOR VEHICLES, POLICE OR HIGHWAY PATROL, AND FROM NUMEROUS HIGHWAY SAFETY ORGANIZATIONS. THE MAJOR

FINDINGS OF THE EVALUATION INCLUDE THE FOLLOWING: THE NEED FOR NATIONALLY REPRESENTATIVE HIGHWAY ACCIDENT DATA; IF ATTAINED, PROVISION OF VALUABLE INFORMATION TO THE NATION'S HIGHWAY SAFETY PROGRAM BY THE NASS' PUBLICLY STATED OBJECTIVES; EMPHASIS ON MOTOR VEHICLE CRASHWORTHINESS IN NASS' PLAN FOR THE NEAR FUTURE WHICH PRIMARILY SUPPORTS NHTSA'S MISSION; PROVISION OF LIMITED CAPABILITY FOR EVALUATING MANY COUNTERMEASURES BY THE NASS PROGRAM ALONE; IMPLEMENTATION OF NASS HAS PROCEEDED BEYOND THE LEVEL OF PLANNING; AND THROUGH IMPROVED PLANNING AND BROADER PERSPECTIVE, POSSIBILITY FOR NASS TO BECOME AN IMPORTANT PART OF THE NATIONAL HIGHWAY SAFETY PROGRAM.

NATIONAL TRANSPORTATION SAFETY BOARD,  
BUREAU OF PLANS AND PROGRAMS, WASHINGTON,  
D.C. 20594

Rept. No. NTSB-SEE-78-1; 1978; 40P 38REFS  
REPT. TO CONGRESS.  
Availability: NTIS

HS-023 353

#### **MECHANISMS, TOLERANCES AND RESPONSES OBTAINED UNDER DYNAMIC SUPERIOR-INFERIOR HEAD IMPACT. A PILOT STUDY. FINAL REPORT**

INSUFFICIENT BIOMECHANICAL DATA EXIST CONCERNING TOLERANCE OF THE SKULL AND CERVICAL SPINE TO DYNAMIC LOADING IN THE SUPERIOR-INFERIOR (S-I) DIRECTION FOR ESTABLISHMENT OF INDUSTRIAL PROTECTIVE HELMET PERFORMANCE SPECIFICATIONS. TO GENERATE NEW DATA ABOUT THE MECHANISMS AND TOLERANCES OF THE BASAL SKULL AND UPPER SPINE UNDER S-I LOADING, ELEVEN HEAD IMPACTS OF UNEMBALMED CADAVERS WERE PERFORMED. THE 9.9 KG PADDED IMPACTOR AT 6.8 TO 10.2 M/S VELOCITY PRODUCED CERVICAL VERTEBRAE FRACTURES WITH NO BASAL SKULL FRACTURE. THE CERVICAL VERTEBRAE FRACTURING APPEARED TO BE THE COMPRESSIVE ARCHING OF THE NECK - PLACING LOADS ON THE SPINOUS PROCESSES AND CONNECTING ARCHES. THE ARCHING FOLLOWED THE NORMAL LORDOTIC CURVATURE OF THE CERVICAL SPINE, AND APPEARED TO DEPEND ON THE INITIAL ROTATION OF THE HEAD AND AXIAL ALIGNMENT OF THE SPINE. FRACTURE PRODUCTION IS NOT THE BEST CRITERION FOR JUDGING THE SEVERITY OF A NECK OR HEAD INJURY, BUT PROVIDES A REASONABLE FIRST STEP. THE MOST IMPORTANT DAMAGE CAUSED BY S-I IMPACTS IS NOT VERTEBRAE FRACTURE BUT DAMAGE TO NERVOUS AND VASCULAR TISSUE SINCE THESE ARE THE MOST DEBILITATING INJURIES. FOR THE TEST CONDITIONS OF THIS RESEARCH, FRACTURES OF THE CERVICAL VERTEBRAE OF NORMAL SUBJECTS BEGAN TO OCCUR FOR PEAK FORCES OVER 5.7 KILONEWTONS, PEAK IMPACTOR VELOCITIES OVER 7.5 METERS PER SECOND, AND INITIAL IMPACT PULSE WORK VALUES OF 380 JOULES. SUBJECTS WITH WEAK OR ABNORMAL STRUCTURE CAN BE EXPECTED TO BEGIN FRACTURING AT APPROXIMATELY A PEAK

FORCE OF 3.6 KILONEWTONS, A PEAK IMPACTOR VELOCITY OF 6.3 METERS PER SECOND, AND AN INITIAL IMPACT PULSE WORK VALUE OF 250 JOULES. FUTURE RESEARCH IN THIS AREA SHOULD CAREFULLY DEFINE REAL WORLD SITUATIONS, CONTROL ALL CONFOUNDING VARIABLES (PARTICULARLY INITIAL ORIENTATIONS), CONSIDER THE ROLE OF LIGAMENTS AND MUSCLES, UTILIZE A COMPREHENSIVE HEAD-NECK INJURY SCALE, AND INVESTIGATE MECHANISMS USING HIGH-SPEED CINERADIOGRAPHY.

by ROGER H. CULVER; MAX BENDER; JOHN W. MELVIN  
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INST., ANN ARBOR, MICH. 48109  
NIOSH-77-12121; NIOSH-77-12123  
Rept. No. UM-HSRI-78-21; 1978; 108P 44REFS  
REPT. FOR JUN 1977-MAR 1978.  
Availability: CORPORATE AUTHOR

HS-023 354

#### **AUTO INSURANCE. FRIEND, FOE, OR FRAUD?**

AN OVERVIEW OF THE INDUSTRY AS IT OPERATES TODAY IS PRESENTED. THERE HAS BEEN SHARP CRITICISM OF LATE BY REGULATORS AND LAWMAKERS WHO FEEL THAT RATE HIKES CAN NO LONGER BE JUSTIFIED IN VIEW OF THE INSURANCE INDUSTRY'S IMPROVING PROFIT POSITION. THE INSURANCE INDUSTRY CLAIMED A HEALTHY 70% INCREASE IN PROFITS LAST YEAR WHILE RUNNING UP THE THIRD WORST UNDERWRITING LOSS IN HISTORY, A STAGGERING \$2.23 BILLION FOR THE ENTIRE PROPERTY-CASUALTY INDUSTRY. IT WAS MORE THAN OFFSET BY THE \$4.5 BILLION OF INVESTMENT INCOME EARNED BY THE INDUSTRY. AFTER MANY YEARS OF ENJOYING SOMEWHAT OF A "SACRED COW" IMAGE, THE INSURANCE INDUSTRY HAS BEEN COMING UNDER ATTACK IN RECENT YEARS AS A RESULT OF HUGE SWINDLES, LARGE RATE HIKES IN MEDICAL MALPRACTICE INSURANCE AND AUTO INSURANCE, AND EXCESSIVE LOBBYING ON BEHALF OF NO-FAULT AUTO INSURANCE. INSURANCE COMPANIES ARE REGULATED BY THE STATES, BUT THERE IS A WIDELY HELD OPINION THAT MOST STATE INSURANCE REGULATIONS HAVE BEEN DRAFTED BY THE INSURANCE COMPANIES THEMSELVES. THERE HAS BEEN MUCH CRITICISM ABOUT THE FACT THAT IN SOME STATES INSURANCE COMMISSIONERS COME FROM THE INSURANCE INDUSTRY. DISCRIMINATION IS ONE OF THE MOST SERIOUS PROBLEMS IN THE AUTO INSURANCE INDUSTRY. THIS TAKES THE FORM OF SUCH PRACTICES AS DENYING DRIVERS THE CHANCE TO BUY INSURANCE AT VOLUNTARY RATES BECAUSE THEIR ETHNIC GROUP OR NEIGHBORHOOD HAS BEEN "REDLINED" OR BECAUSE MASSIVE STOCK MARKET LOSSES HAVE FORCED THE INDUSTRY TO CUT BACK IN HIGH-LOSS AREAS. AUTO INSURANCE CAN NOT ONLY BE COSTLY BUT HARD TO FIND. IT IS NOT UNUSUAL FOR INSURANCE COMPANIES TO REFUSE TO RENEW POLICYHOLDERS SIMPLY FOR NO MORE THAN A SINGLE NON-ACCIDENT TICKET. INSURANCE COMPANIES ALLEGEDLY DISCRIMINATE BECAUSE OF THEIR COMPULSION TO CURB LOSSES AND MAXIMIZE PROFITS BY TAKING ONLY THOSE



BEST RISKS. INSURANCE COMPANIES CITE THE REASONS FOR THEIR RATING SYSTEMS AND RISING COSTS AS INFLATION, THE HIGH COST OF AUTO REPLACEMENT PARTS AND AUTO BODY REPAIR LABOR, RISING HOSPITAL COSTS, FRAUDULENT CLAIMS, AUTO THEFT, LAWYERS URGING MASSIVE JURY AWARDS, UNSAFE CARS, AND THE DESIGN OF TODAY'S AUTOMOBILES WITH THEIR ARRAY OF SAFETY FEATURES.

by JACK SCAGNETTI

Publ: MOTOR TREND V29 N12 P93-8 (DEC 1977)  
1977

PTS. 2-5 ARE HS-023 355--HS-023 358.

Availability: SEE PUBLICATION

HS-023 355

### **AUTO INSURANCE. HIGH RATES DICTATE MOTORISTS' BUYING TRENDS**

SKYROCKETING CAR INSURANCE PREMIUMS POSE A MAJOR ECONOMIC AND SOCIAL PROBLEM FOR THE MOTORING PUBLIC. MORE THAN 90 MILLION CARS ARE INSURED, MANY AT A COST DRIVERS FIND DIFFICULT TO AFFORD. MILLIONS OF OTHER MOTOR VEHICLES ARE NOT INSURED, SIMPLY BECAUSE CAR OWNERS CANNOT AFFORD THE PREMIUMS. THE HIGH COST OF INSURANCE TODAY MAY WELL DICTATE THE TYPE OF AUTOMOBILE PEOPLE WILL BUY, AND WHETHER THEY CAN AFFORD TO PURCHASE A SECOND OR THIRD CAR FOR THE FAMILY HOUSEHOLD. INSURANCE PLAYS A MAJOR ROLE IN THE TOTAL COST OF BUYING AND OPERATING A MOTOR VEHICLE. THE FACT IS MANY MOTORISTS ARE SPENDING MORE FOR CAR INSURANCE THAN FOR GASOLINE AND OIL. INSURANCE PREMIUMS OF MORE THAN \$1000 ANNUALLY ARE NOT UNCOMMON TODAY. DRIVERS ARE REBELLING OVER THE SKYROCKETING INSURANCE RATES, WITH LETTERS POURING INTO OFFICES OF INSURANCE COMPANIES, STATE INSURANCE COMPANIES, STATE INSURANCE COMMISSIONERS, GOVERNMENT OFFICIALS, CONSUMER GROUPS, AND CAR CLUBS. THERE ARE ESSENTIALLY THREE DRIVER TYPES THAT AN INSURANCE COMPANY MAY ELECT TO WRITE, PREFERRED RISKS WITH RELATIVELY LOW-RISK EXPOSURE; STANDARD RISKS; AND NONSTANDARD (OR SUBSTANDARD) RISKS, COMPRISED OF HIGH-RISK DRIVERS WHO ARE UNABLE TO OBTAIN ADEQUATE COVERAGE AT THE PREVAILING MARKET RATES OR UNDER THE ASSIGNED RISK PLANS. PREFERRED RISKS, ACCOUNTING FOR APPROXIMATELY 52% OF THE TOTAL INSURANCE MARKET, TYPICALLY ARE CHARGED RATES 10%-20% BELOW STANDARD RATES. NONSTANDARD RISKS, REPRESENTING ABOUT 8% OF THE MARKET, PAY AS MUCH AS 50% HIGHER THAN STANDARD RATES. THE FIVE BASIC FACTORS THAT ENTER INTO THE PRICING AND RISK CLASSIFICATION OF A PARTICULAR DRIVER AND HIS/HER CAR ARE AS FOLLOWS: GEOGRAPHIC ENVIRONMENT, MANNER IN WHICH A DRIVER OPERATES HIS/HER CAR, DRIVING RECORD, VALUE OF THE CAR, AND COST OF EACH CLAIM. TO SAVE MONEY IN BUYING AUTO INSURANCE, IT IS ADVANTAGEOUS TO SHOP AROUND, PREFERABLY WITH AN INDEPENDENT AGENT AND ONE WHO HAS BEEN SUGGESTED BY A

SATISFIED RELATIVE OR FRIEND. FACTORS TO CONSIDER IN SELECTING AN INSURANCE COMPANY INCLUDE NOT ONLY PRICE BUT ALSO CLAIMS PRACTICES, RANGE OF SERVICES, AND THE PARTICULAR COVERAGES OFFERED TO MEET INDIVIDUAL NEEDS. IT IS ADVISABLE TO CHECK FOR DISCOUNTS WHICH A COMPANY MIGHT OFFER BECAUSE OF THE FOLLOWING REASONS: MORE THAN ONE CAR INSURED WITH THE SAME COMPANY, NO RECENT ACCIDENTS OR SERIOUS TRAFFIC VIOLATIONS, A CAR DRIVEN LESS THAN 12,000 MILES/YEAR, A CAR DRIVEN BY A NONDRINKER, ETC.

by JACK SCAGNETTI

Publ: MOTOR TREND V30 N1 P71-7 (JAN 1978)  
1978

PT. 1 IS HS-023 354; PTS. 3-5 ARE HS-023 356--HS-023 358.

Availability: SEE PUBLICATION

HS-023 356

### **AUTO INSURANCE. PT. 3. ACCIDENT CLAIMS-- REAL AND FAKE--DRIVE INSURANCE PREMIUMS UP**

THE RISING COSTS OF AUTO BODY REPAIR AND OF SETTling BODILY INJURY CLAIMS TAKE MUCH BLAME FOR INSURANCE RATES MORE THAN DOUBLING IN RECENT YEARS. INSURANCE COMPANIES SAY APPROXIMATELY TWO THIRDS OF THE INSURANCE PREMIUM GOES FOR REPAIRING CARS, WHILE ONE THIRD GOES TO MEDICAL BILLS. ONE OF EVERY FOUR DRIVERS IN THE U.S. MAY BE INVOLVED IN AN AUTO ACCIDENT WITH CRASH DAMAGE TO HIS/HER CAR THIS YEAR, AND THE STARTLING FACT IS THAT DAMAGE TO LESS THAN ONE FOURTH OF A CAR'S PARTS COULD COST MORE TO REPAIR THAN THE CAR IS WORTH. HOWEVER, WHEN SUCH EXTENSIVE DAMAGE DOES OCCUR, THE CAR OWNER IS PAID THE CURRENT VALUE OF THE CAR BY THE INSURANCE COMPANY AND THE CAR IS TOTALED OUT. CAR MAKERS OBJECT TO COMPLAINTS BY THE INSURANCE INDUSTRY AND INDEPENDENT BODY SHOP OPERATORS THAT THE CRASH PART PRICES ARE EXORBITANT, AND TO CRITICISM OF THE MANNER IN WHICH THE PARTS ARE DISTRIBUTED. FROM 1971 TO 1977, CRASH PARTS PRICES ROSE AT AN ANNUAL AVERAGE OF 7.5% TO 8%; MOST OF THE HIKE CAME DURING THE LAST THREE YEARS, SINCE RIGID GOVERNMENT PRICE CONTROLS PREVENTED BOOSTS FROM 1971 THROUGH 1973. AUTO MAKERS ALSO CRITICIZE INSURANCE COMPANIES WHICH COMPARE THE COST OF A FRONT END COLLISION ON A 1973 OR EARLIER MODEL VEHICLE WITH SIMILAR REPAIRS ON A 1975 MODEL WITHOUT DISCLOSING THAT THE 5 MPH FEDERAL BUMPER STANDARD IN AND OF ITSELF CAUSED AN INCREASE IN BUMPER PRICES OF OVER 60% OVERNIGHT. BUMPER SYSTEMS TOGETHER CONSTITUTE THE LARGEST SOURCE OF REPAIR COST. CAR MANUFACTURERS SAY THEY ARE ACTIVELY WORKING TO REDUCE THE DAMAGEABILITY OF FUTURE MODELS, BUT THAT IT IS NOT AN EASY TASK. INSURANCE COMPANIES ARE BEGINNING TO CONSIDER DAMAGEABILITY DATA IN DETERMINING RATES. BODY SHOPS POINT OUT THAT CARS ARE MORE COMPLEX AND MORE DIFFICULT TO REPAIR

TODAY, AND MORE EXPENSIVE EQUIPMENT IS NEEDED. ALSO, BODY SHOP OWNERS COMPLAIN THAT INSURANCE COMPANIES HAVE PREFERRED LISTS OF BODY SHOPS THAT AGREE TO DO REPAIRS AT LABOR RATES ESTABLISHED BY THE COMPANIES. COMPLAINTS OF DISHONESTY OR UNFAIRNESS BY BODY SHOPS AND INSURANCE APPRAISERS POUR INTO GOVERNMENT OFFICES. ONE OF THE MOST SERIOUS PROBLEMS PLAGUING INSURANCE COMPANIES IS THE INCREASING TENDENCY OF PEOPLE TO SUE FOLLOWING AN ACCIDENT, AND THE RESULTANT MASSIVE INJURY AWARDS. EQUALLY SERIOUS IS THE GROWING NUMBER OF FRAUDULENT, STAGED ACCIDENTS. POLICE REPORT THAT AUTO INSURANCE FRAUD IS VERY OFTEN THE SPECIALTY OF LARGE, HIGHLY ORGANIZED PROFESSIONAL RINGS.

by JACK SCAGNETTI

Publ: MOTOR TREND V30 N2 P71-7 (FEB 1978)  
1978

PTS. 1-2 ARE HS-023 354--HS-023 355; PTS. 4-5 ARE HS-023 357--HS-023 358.

Availability: SEE PUBLICATION

HS-023 357

#### **AUTO INSURANCE. PT. 4. CONTROVERSIAL AIR BAGS AND TREND TOWARD SMALLER CARS AFFECT PREMIUMS**

IT IS GOING TO TAKE A CONCERTED EFFORT BY MOTORISTS, CAR MAKERS, AND THE GOVERNMENT, ALL FULLY COOPERATING, TO REDUCE ACCIDENTS AND CLAIMS AND HOLD THE LINE ON STEADILY RISING INSURANCE RATES. EXCEPT FOR A FEW INNOVATIONS INSPIRED BY AUTO RACING, NOT MUCH HAPPENED FOR THE CAUSE OF VEHICLE SAFETY UNTIL 1966, WHEN FEDERAL VEHICLE SAFETY STANDARDS WERE ADOPTED FOR NEW CARS. THE MOST CONTROVERSIAL FEDERAL REGULATION IS THE SEAT BELT. DESPITE IMPROVED DESIGNS, ONLY ABOUT 20% OF AMERICAN MOTORISTS USE SEAT BELTS. FOR THE PAST DECADE THERE HAS BEEN A BATTLE RAGING IN WASHINGTON OVER WHETHER VEHICLES WILL HAVE AIR BAGS OR OTHER AUTOMATIC (PASSIVE) RESTRAINT SYSTEMS. THE GOVERNMENT FAVORS REGULATIONS FOR AIR BAGS, THE INSURANCE INDUSTRY SUPPORTS THEIR USE, BUT THE AUTO MAKERS AND SOME OTHER INDUSTRY OBSERVERS ARE CRITICAL OF THEM. CONGRESS HAS BACKED A DEPT. OF TRANSPORTATION (DOT) DECISION, FEDERAL MOTOR VEHICLE SAFETY STANDARD 208, TO REQUIRE AIR BAGS OR OTHER PASSIVE SAFETY DEVICES TO BE INSTALLED IN ALL NEW CARS BY THE 1984 MODEL YEAR, AND IN ALL LARGE CARS BY MODEL YEAR 1982. THE INSURANCE INDUSTRY HAS REPORTEDLY SPENT SEVERAL MILLION DOLLARS PUSHING FOR MANDATORY AIR BAGS DURING THE PAST DECADE. IN ADDITION TO ISSUING SAFETY STANDARDS, DOT CONDUCTS SAFETY DEFECT INVESTIGATIONS IN VEHICLES AND WORKS TO HAVE DEFECTIVE VEHICLES RECALLED BY MANUFACTURERS FOR REPAIR. DOT IS CONDUCTING A MAJOR INVESTIGATION OF FUEL TANK FIRES IN SUBCOMPACT PASSENGER CARS. GOVERNMENT EFFORTS TO MAKE CARS SAFER HAVE IN-

VOLVED CONTRACTS WITH MANUFACTURERS TO PRODUCE PROTOTYPE EXPERIMENTAL SAFETY CARS. A MAJOR TASK FACING CAR MANUFACTURERS IS DESIGNING AND BUILDING SMALL CARS THAT ARE SAFE. WHILE MANY AUTO OWNERS NOT ONLY SHOW LITTLE INTEREST IN SAFETY OPTIONS AVAILABLE IN NEW CARS, THEY CONTRIBUTE FURTHER TO HIGHER INSURANCE RATES BY DRINKING AND DRIVING. DRINKING IS INDICATED TO BE A FACTOR IN AT LEAST HALF OF THE NEARLY 50,000 ANNUAL FATAL MOTOR VEHICLE ACCIDENTS. FEDERAL AND COMMUNITY PROGRAMS TO REDUCE ALCOHOL-RELATED AUTO CRASHES HAVE THUS FAR PROVED TO BE INEFFECTIVE. BECAUSE THE MAJORITY OF DRIVERS HAVE THE MAJORITY OF ACCIDENTS, WIDESPREAD DRIVER LICENSING AND DRIVER EDUCATION PROGRAMS THAT REACH ALL DRIVERS RATHER THAN BEING ABLE TO FOCUS ON A SMALL CORE OF PROBLEM DRIVERS ARE NEEDED. LOOKING TO THE FUTURE, SAFER CARS, SAFER ROADS, AND HOPEFULLY, SAFER DRIVERS SHOULD STABILIZE INSURANCE COSTS.

by JACK SCAGNETTI

Publ: MOTOR TREND V30 N3 P92-9 (MAR 1978)  
1978

PTS. 1-3 ARE HS-023 354--HS-023 356; PT. 5 IS HS-023 358.

Availability: SEE PUBLICATION

HS-023 358

#### **AUTO INSURANCE. PT. 5. FITTING FINALE TO A CONTROVERSIAL SERIES: NO-FAULT AUTO INSURANCE, PROS AND CONS--AND WHAT TO EXPECT IN THE FUTURE**

NO-FAULT INSURANCE PLANS NOW IN EFFECT IN A NUMBER OF STATES AND PROPOSED FEDERAL NO-FAULT STANDARDS ARE CONSIDERED. NO-FAULT IS AN AUTO INSURANCE PLAN IN WHICH EACH DRIVER/OWNER ACCEPTS FINANCIAL RESPONSIBILITY FOR SOME OR ALL LOSSES SUSTAINED BY HIMSELF/HERSELF, PEDESTRIANS HIT BY HIM/HER, AND OCCUPANTS OF HIS/HER VEHICLE, IN RETURN FOR WHICH HE/SHE ENJOYS IMMUNITY FROM LIABILITY FOR LOSSES TO THIRD-PARTY PERSONS. THERE HAS BEEN A CONTROVERSY OVER NO-FAULT INSURANCE FOR THE PAST EIGHT YEARS, AND THE PRIMARY QUESTION TODAY IS WHETHER CONGRESS SHOULD PRESCRIBE A UNIFORM NO-FAULT SYSTEM FOR THE STATES OR SHOULD THE MATTER BE LEFT TO THE JUDGMENT OF THE 50 STATE LEGISLATURES. THE FIRST TRUE NO-FAULT LAW WAS PASSED BY MASSACHUSETTS IN 1970 AND WENT INTO EFFECT ON 1 JAN 1971. IT IS A COMPULSORY PLAN CALLING FOR LIMITED FIRST-PARTY, NO-FAULT COVERAGE FOR BODILY INJURY. PROPERTY DAMAGE WAS ADDED TO THE PLAN EFFECTIVE IN 1972. SINCE 1970, 16 STATES HAVE ENACTED LEGISLATION MODIFYING THE FAULT SYSTEM OF COMPENSATING AUTO ACCIDENT VICTIMS. ANOTHER TEN STATES HAVE PASSED LAWS THAT PROVIDE FOR NO-FAULT INSURANCE BENEFITS WITHOUT LIMITING THE RIGHT TO COLLECT DAMAGES FOR PAIN AND SUFFERING FROM THE DRIVER AT FAULT IN THE ACCIDENT. IN JUN 1977, THE DEPT. OF TRANSPORTATION (DOT) PUBLISHED A

DETAILED STUDY OF NO-FAULT PLANS IN 16 STATES AND CONCLUDED THAT THE SYSTEM WORKS, STATING THAT IT PROVIDES QUICKER AND MORE EQUITABLE BENEFITS THAN DOES THE TRADITIONAL LIABILITY SYSTEM. THE ASSOCIATION OF TRIAL LAWYERS OF AMERICA PUBLISHED A 37-PAGE CRITIQUE OF THE DOT REPORT, CITING THE BASIC ISSUE AS "WHETHER ALL CITIZENS SHOULD SACRIFICE INDIVIDUAL RIGHTS TO JOIN IN A COLLECTIVE SECURITY PLAN OF THE WELFARE STATE IN WHICH INNOCENT VICTIMS MUST SHARE THE COST OF COMPENSATING THE RECKLESS DRIVERS WHO INJURY THEM..." THE SENATE BILL S. 1381 AND THE HOUSE BILL H.R. 6601 WOULD SET NATIONAL MINIMUM STANDARDS FOR STATE NO-FAULT LAWS. THE NATIONAL STANDARDS WOULD REQUIRE THE PURCHASE OF CERTAIN FIRST-PARTY COVERAGES BY ALL MOTOR VEHICLE OWNERS (MOTORCYCLISTS WOULD BE FULLY OR PARTIALLY EXCLUDED). OP-  
 PONENTS OF THE FEDERAL STANDARDS ARGUE THAT GREAT VARIATIONS EXIST ACROSS THE U.S. IN TRAFFIC PATTERNS, COURT CONDITIONS, THE MIX OF URBAN AND RURAL INHABITANTS, PER CAPITA INCOME, NATURAL ENVIRONMENT, ETC., AND THUS IT IS IMPOSSIBLE FOR A FEDERAL LAW TO PROVIDE A SYSTEM THAT MEETS THESE DIVERSE NEEDS. THE NATIONAL ASSOCIATION OF INSURANCE AGENTS BACKS STATE REGULATION. SEVERAL LARGE INSURANCE COMPANIES BELIEVE THAT MORE PRACTICAL EXPERIENCE IS NEEDED BEFORE A UNIFORM SYSTEM IS ENACTED AT THE FEDERAL LEVEL.

by JACK SCAGNETTI

Publ: MOTOR TREND V30 N4 P59-60, 62-5 (APR 1978)  
 1978

PTS. 1-4 ARE HS-023 354-HS-023 357.

Availability: SEE PUBLICATION

HS-023 359

#### **CB RADIO FOR HIGHWAY SAFETY COMMUNICATIONS [CITIZENS BAND]**

CURRENT AND FUTURE PROGRAMS USING TWO-WAY RADIO FOR HIGHWAY SAFETY COMMUNICATIONS ARE REVIEWED. THE DRAMATIC GROWTH FROM 2.5 MILLION TO 20 MILLION CITIZENS BAND (CB) RADIOS IN USE FROM 1970 TO 1977 IS ATTRIBUTED IN LARGE MEASURE TO THE MOTORIST'S DESIRE FOR COMMUNICATIONS. POTENTIAL SAVINGS IN LIVES, PROPERTY, AND FUEL THROUGH REDUCED REPORTING TIME ARE ACHIEVED THROUGH CITIZENS BAND RADIO EMERGENCY MONITORING PROGRAMS. THE FOLLOWING CURRENT CITIZENS BAND SAFETY PROGRAMS ARE REVIEWED: OHIO REACT (RADIO EMERGENCY OF ASSOCIATED CITIZENS TEAMS), MEP (MICHIGAN EMERGENCY PATROL) REACT IN DETROIT, MISSOURI HWY. PATROL EXPERIENCE, AND THE NEAR (NATIONAL EMERGENCY AID RADIO) PROGRAM OF THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION (NHTSA). LOOKING TO THE FUTURE, PERSONAL COMMUNICATIONS SIMILAR TO THAT AVAILABLE THROUGH CITIZENS BAND RADIO WILL LIKELY MAINTAIN AND IMPROVE ITS POPULARITY, BECAUSE OF THE FOLLOWING ADVANTAGES OF SUCH SYSTEMS: PROVIDES AN EFFECTIVE MEANS FOR EMERGENCY COMMUNICATIONS

FROM THE VEHICLE; PROVIDES AN IMMEDIATE SOURCE OF INFORMATION ON DEMAND BY THE MOTORIST FROM OTHER HIGHWAY USERS OR FROM A FIXED BASE SOURCE; PROVIDES A VERSATILE SOURCE OF COMMUNICATIONS FROM THE VEHICLE FOR ALL PERSONAL, BUSINESS, OR RECREATIONAL PURPOSES; IS AVAILABLE TO ALL TYPES OF USERS (INDIVIDUALS, PUBLIC SAFETY ORGANIZATIONS, AND OTHER GROUPS) WITH FULL INTERCHANGE OF COMMUNICATION POSSIBLE FROM ALL TYPES OF VEHICLES, BOATS, CYCLES, AIRCRAFT AND FIXED BASED STATIONS; IS EASY TO USE AND INSTALL, AND IS INEXPENSIVE.

by GERALD H. REESE

REACT INTERNATIONAL, INC.

Rept. No. SAE-770318; 1977; 8P 5REFS

PRESENTED AT INTERNATIONAL AUTOMOTIVE ENGINEERING CONGRESS AND EXPOSITION, DETROIT, 28 FEB-4 MAR 1977.

Availability: SAE

HS-023 361

#### **DIESEL FUEL PROPERTIES AND ENGINE PERFORMANCE**

TESTS WERE CONDUCTED WITH DIESEL FUELS OF VARYING 10% RECOVERED POINT (365°-520° F OR 185°-271° C), 95% RECOVERED POINT (520°-750° F OR 271°-399° C), AND AROMATICS CONTENT (15%-40%) TO DETERMINE THEIR PERFORMANCE IN U.S. AND EUROPEAN LIGHT-DUTY AND HEAVY-DUTY DIESEL ENGINES. IN THE U.S. LABORATORY TEST PROGRAM, EMISSION LEVELS WERE MORE DEPENDENT ON ENGINE DESIGN THAN ON FUEL QUALITY OVER THE RANGE TESTED. FROM THE DIFFERENT ENGINES, HYDROCARBON (HC) EMISSIONS RANGED FROM 0.7 TO 2.4 G/BHP-HR AND NITROGEN OXIDES (NOX) EMISSIONS RANGED FROM 7.0 TO 17.1 G/BHP-HR. FUEL VOLATILITY CHANGES HAD A SMALL EFFECT ON HC EMISSIONS MEASURED OVER THE 13-MODE FEDERAL TEST CYCLE. INCREASING 10% POINT RESULTED IN A SMALL DECREASE IN HC (ABOUT 10% PER 50° F CHANGE) IN THREE ENGINES AND HAD NO EFFECT IN THE FOURTH, WHICH WAS UNAFFECTED BY ANY FUEL VARIABLE. INCREASING 50% POINT ALSO RESULTED IN DECREASED HC EMISSIONS FROM THE SAME THREE ENGINES. ALSO, 95% POINT HAD LITTLE EFFECT, AND AROMATICS CONTENT HAD NO EFFECT ON HC EMISSIONS. INCREASING CETANE NUMBER RESULTED IN DECREASED HC EMISSIONS (ABOUT 10% PER TEN CETANE NUMBERS) FROM THE THREE ENGINES AFFECTED BY FUEL PROPERTIES. CARBON MONOXIDE (CO) AND NOX WERE NOT SUBSTANTIALLY AFFECTED BY FUEL PROPERTIES IN ANY OF THE ENGINES. ODOR WAS AFFECTED BY FUEL CHANGES. INCREASING AROMATICS CONTENT RESULTED IN INCREASED ODOR FROM THREE ENGINES. INCREASED 95% POINT RESULTED IN LOWER ODOR, AND THIS FUEL VARIABLE HAD THE GREATEST EFFECT IN EACH OF THE ENGINES TESTED. SMOKE, POWER, AND FUEL CONSUMPTION WERE RELATIVELY UNAFFECTED BY FUEL CHANGES. EUROPEAN LABORATORY TESTS CONFIRMED U.S. TESTS FOR SMOKE, FUEL CONSUMPTION, AND GASEOUS EMISSIONS. FIELD TESTS OF EUROPEAN ENGINES USING FUELS WITH NOR-

MAL AND HIGH 95% POINTS IN SEVERE BUS FLEET SERVICE SHOWED NO ADVERSE EFFECTS ON SMOKE, MAINTENANCE, INJECTOR CLEANLINESS, OR ENGINE DEPOSITS FOR THE HEAVIER FUEL. BASED ON THE U.S. AND EUROPEAN TESTS, SATISFACTORY PERFORMANCE HAS BEEN DEMONSTRATED FOR THE RANGE OF FUELS TESTED.

by F. J. HILLS; C. G. SCHLEYERBACH  
MOBILE RES. AND DEVEL. CORP.; MOBIL OIL A.G.  
Rept. No. SAE-770316; 1977; 15P 6REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 362

### **MOTORCYCLE ACCIDENT STATISTICS: PROBLEMS AND EVALUATION**

THIS BOOKLET IS A COMPENDIUM OF ELEMENTAL MOTORCYCLE SAFETY-RELATED STATISTICS (REGISTRATIONS, ACCIDENTS, FATALITIES, ACCIDENTS/REGISTRATIONS, FATALITIES/REGISTRATIONS, AND FATALITIES/ACCIDENTS FOR THE PERIOD 1963-1976). DATA ARE PRESENTED AS RAW "CLEAN" STATISTICS, RAW NORMALIZED "CLEAN" STATISTICS, AND COMPARISONS WITH TOTAL MOTOR VEHICLE DATA. GUIDELINES ARE APPENDED FOR UNIFORM METHODS OF DATA COLLECTION, RECORDING, AND DISSEMINATION.

by GARY L. WINN  
AMERICAN MOTORCYCLIST ASSOC., WESTERVILLE,  
OHIO 43081  
1978; 41P 20REFS  
Availability: CORPORATE AUTHOR

HS-023 363

### **NOISE AND DRIVER PERFORMANCE**

THE DEMANDS OF ACTUAL AUTOMOBILE DRIVING AND CONCURRENT NOISE STRESS ON HUMAN INFORMATION-PROCESSING CAPACITY FOR EIGHT LICENSED, COLLEGE-AGED DRIVERS WERE ESTIMATED FROM THE DECREMENT IN PERFORMANCE ON THE DELAYED DIGIT RECALL SUBSIDIARY TASK, USING MULTIVARIATE TECHNIQUES AND A COUNTERBALANCED DESIGN. UNDER HIGH LOAD, DRIVERS WERE MUCH MORE LIKELY TO REDUCE ACCURACY THAN SACRIFICE SPEED. HOWEVER, NOISE DID NOT RESULT IN DRIVING ERROR WHEN PRESENTED IN THE ABSENCE OF ADDITIONAL LOAD. THIS CONCLUSION PARALLELS THE 1973 FINDINGS OF MOSCOWITZ, WHO INVESTIGATED THE EFFECT OF ALCOHOL ON DRIVING PERFORMANCE. AS EXPECTED, THE SUBSIDIARY TASK MEASURE WAS SENSITIVE TO THE ADDITIONAL INFORMATION-PROCESSING DEMANDS IMPOSED BY THE UNPREDICTABLE NOISE STIMULUS; BUT CONTRARY TO EXPECTATION, INCLUSION OF THE SUBSIDIARY TASK TENDED TO INTERACT SLIGHTLY WITH NOISE IN IMPAIRING DRIVING PERFORMANCE. PERHAPS IN THE STUDY'S LOW-RISK DRIVING ENVIRONMENT (RUBBER PYLONS ON AN ISOLATED TEST TRACK), MAINTENANCE OF PERFORMANCE ON THE SUBSIDI-

ARY TASK MAY HAVE HAD SUFFICIENTLY HIGH SUBJECTIVE UTILITY TO DEMAND A DISPROPORTIONATELY LARGE SHARE OF INFORMATION PROCESSING CAPACITY. HOWEVER, IF THE PYLON HAD BEEN CONSTRUCTED OF CONCRETE INSTEAD OF RUBBER, THE PERCEIVED RISK OF DRIVING MIGHT HAVE BEEN GREATER, SUCH THAT ALLOCATION OF DRIVER ATTENTION COULD HAVE BEEN REVERSED, WITH DRIVING FAVORED OVER THE SUBSIDIARY TASK.

by JAY M. FINKELMAN; LAWRENCE R. ZEITLIN;  
JOHN A. FILIPPI; MICHAEL A. FRIEND  
Publ: JOURNAL OF APPLIED PSYCHOLOGY V62 N6  
P713-8 (1977)  
1977; 22REFS  
Availability: SEE PUBLICATION

HS-023 364

### **FACTORS IN THE INITIATION OF BICYCLE- MOTOR VEHICLE COLLISIONS**

A STUDY WAS MADE OF 888 REPORTED BICYCLE/MOTOR VEHICLE COLLISIONS RESULTING IN INJURY TO THE BICYCLIST, MOTORIST, OR PASSENGER OF EITHER VEHICLE IN ORDER TO INVESTIGATE THE CHARACTERISTICS OF THE OPERATORS INVOLVED RELATIVE TO THE PROBABLE RESPONSIBILITY FOR THE COLLISION OF THE BICYCLIST OR MOTORIST AND/OR THEIR VEHICLE BASED ON THE PRE-CRASH MOVEMENTS OF THE VEHICLES, AND TO EXAMINE BICYCLE/MOTOR VEHICLE COLLISIONS IN RELATION TO BICYCLIST AGE. ON THE BASIS OF THE MOVEMENTS OF THE VEHICLES INVOLVED, THE BICYCLIST OR THE BICYCLE OR BOTH WERE PROBABLY RESPONSIBLE FOR THE INITIATION OF MORE THAN THREE FOURTHS OF THE COLLISIONS. BICYCLIST AGE WAS STRONGLY RELATED TO PROBABLE RESPONSIBILITY FOR THE COLLISION. THROUGH AGE 12, NINE OUT OF TEN BICYCLISTS WERE PROBABLY RESPONSIBLE FOR THE COLLISION; ABOVE AGE 12, PROBABLE RESPONSIBILITY DECREASED IN PROPORTION TO AGE; ONLY 34% OF THE BICYCLISTS AGED 25 YEARS OR OLDER WERE PROBABLY RESPONSIBLE. COLLISIONS INVOLVING BICYCLISTS IN VARIOUS AGE GROUPS DIFFERED CONSIDERABLY IN WHERE, WHEN, AND HOW THEY OCCURRED. THE MOVEMENTS OF THE VEHICLES PRIMARILY INVOLVED IN THE INITIATION OF THE COLLISIONS WERE EVALUATED IN TERMS OF COUNTERMEASURE PLANNING. TEN STRATEGIES, IN THEIR LOGICAL SEQUENCE, WHICH CAN BE APPLIED TO BICYCLE/MOTOR VEHICLE CRASHES (EXAMPLES OF APPLICATION ARE PROVIDED) ARE OUTLINED AND INCLUDE THE FOLLOWING: PREVENT THE INITIAL MARSHALLING OF THE FORM OF ENERGY; REDUCE THE AMOUNT OF ENERGY MARSHALLED; PREVENT THE RELEASE OF THE ENERGY (AT RATES AND IN CIRCUMSTANCES LIKELY TO PRODUCE DAMAGE TO PEOPLE OR PROPERTY) THROUGH CRASH PREVENTION EFFORTS INVOLVING HUMAN, VEHICLE, AND ENVIRONMENTAL FACTORS; MODIFY THE RATE OR SPATIAL DISTRIBUTION OF RELEASE OF ENERGY FROM ITS SOURCE. SEPARATE IN SPACE OR TIME, THE ENERGY BEING RELEASED FROM THE SUSCEPTIBLE STRUCTURE.

SEPARATE THE ENERGY BEING RELEASED FROM THE SUSCEPTIBLE STRUCTURE BY INTERPOSITION OF A MATERIAL BARRIER; MODIFY THE CONTACT SURFACE, SUBSURFACE, OR BASIC STRUCTURE WHICH CAN BE IMPACTED; STRENGTHEN THE LIVING OR NONLIVING STRUCTURE WHICH MIGHT BE DAMAGED BY THE ENERGY TRANSFER; MOVE RAPIDLY IN DETECTION AND EVALUATION OF DAMAGE AND COUNTER ITS CONTINUATION AND EXTENSION; AND CONSIDER ALL THOSE MEASURES WHICH FALL BETWEEN THE EMERGENCY PERIOD FOLLOWING THE DAMAGING ENERGY EXCHANGE AND THE FINAL STABILIZATION OF THE PROCESS (INCLUDING INTERMEDIATE AND LONG-TERM REPARATIVE AND REHABILITATIVE MEASURES).

by ALLAN F. WILLIAMS  
 Publ: AMERICAN JOURNAL OF DISEASES OF  
 CHILDREN V130 N4 P370-7 (APR 1976)  
 1976; 24REFS  
 Availability: SEE PUBLICATION

HS-023 365

#### CHANGING FACE OF C.B. [CITIZENS BAND RADIO]

A REVIEW OF THE PAST, A CONCENTRATION ON PRESENT DEVELOPMENTS, AND AN ATTEMPT TO LOOK INTO THE FUTURE WITH REGARD TO THE CLASS D CITIZENS BAND (CB) RADIO ARE PRESENTED. FROM A SLOW START IN 1958 WHEN THE FCC (FEDERAL COMMUNICATIONS COMMISSION) ESTABLISHED A 23-CHANNEL CLASS D CITIZENS BAND RADIO SERVICE, SUCH SYSTEMS HAVE GROWN TO REPRESENT ONE OF THE LARGEST SEGMENTS OF TODAY'S CONSUMER ELECTRONICS MARKET. PRIOR TO 1976, THE CITIZENS BAND RADIO WAS CHARACTERIZED AS FOLLOWS: MECHANICAL CHANNEL SELECTOR SWITCH AND DISPLAY; HETERODYNE CRYSTAL SYNTHESIZER (UP TO 14 CRYSTALS, CONTROLLED BY SWITCHING CRYSTALS); DISCRETE TRANSISTOR CIRCUITRY; BASICALLY 50 DB SYSTEMS AND SIGNALS; SERIOUS USER AND HOBBYIST MARKET; AND UNDER-DASH UNITS. THE FOLLOWING FACTORS DURING THE 1973-1975 PERIOD BROUGHT DRASTIC CHANGES TO THE CITIZENS BAND DESIGN: TALK OF INCREASED CHANNELS, MEANING THE NEED FOR EVEN MORE CRYSTALS (AND COST) IN THE SYNTHESIZER IF THE HETERODYNE SYNTHESIZER WERE RETAINED; A SHORTAGE OF CRYSTALS IN THE INDUSTRY; AND THE DOUBLING OF THE MARKET EACH YEAR AND A TRANSITION FROM A SERIOUS USER AND HOBBYIST MARKET TO A CONSUMER MARKET. THESE FACTORS LED TO THE DEVELOPMENT OF THE CITIZENS BAND DIGITAL PHASE LOCKED LOOP FREQUENCY SYNTHESIZER WHICH IN TURN WAS THE SPARK THAT STARTED A REVOLUTION IN CITIZENS BAND DESIGN. TODAY THE CITIZENS BAND RADIO CAN BE CHARACTERIZED AS FOLLOWS: MECHANICAL CHANNEL SELECTOR SWITCH, WITH ELECTRONIC DISPLAY, PLUS NEW HUMAN INTERFACES; DIGITAL PHASE LOCKED LOOPED SYNTHESIZERS (ONE TO THREE CRYSTALS, CONTROLLED BY D.C. LOGIC LEVELS); REMOTE UNITS; DISCRETE TRANSISTOR CIRCUITRY PLUS ONE SYNTHESIZER AND ONE AUDIO I.C.; BASICALLY 60 DB SYSTEMS AND

SIGNALS; SERIOUS USER, HOBBYIST, AND CONSUMER MARKET; UNDER-DASH UNITS, BUT ALSO REMOTE UNITS WITH CONTROLS IN MICROPHONE, AND IN-DASH UNITS; AND REDUCED PARTS COUNT. TRENDS FOR THE FUTURE INCLUDE THE FOLLOWING: 50% REDUCTION IN PARTS COUNT IN 1977-1978; MORE ELECTRONIC AND LESS MECHANICAL HUMAN INTERFACE; NEW GENERATIONS OF DIGITAL P.L.L. SYNTHESIZERS, HIGHLY INTEGRATED WITH FEWER EXTERNAL DISCRETE COMPONENTS; NONTRANSMITTER CIRCUITRY, SEVERAL I.C.'S, FEW EXTERNAL DISCRETE COMPONENTS; 60 DB OR GREATER SYSTEMS AND SIGNALS; MATURE CONSUMER MARKET; UNDER-DASH UNITS, REMOTE UNITS, IN-DASH UNITS, AND OTHER NEW VARIATIONS; AND NEW AND IMPROVED TRANSMITTER CIRCUITRY.

by GARY L. WILHELM  
 E. F. JOHNSON CO.  
 Rept. No. SAE-770317; 1977; 8P 6REFS  
 PRESENTED AT INTERNATIONAL AUTOMOTIVE  
 ENGINEERING CONGRESS AND EXPOSITION,  
 DETROIT, 28 FEB-4 MAR 1977.  
 Availability: SAE

HS-023 366

#### HUNTING THE EVASIVE SOLUTIONS TO MEDICAL IMPAIRMENT AND HIGHWAY CRASHES

AS FOR CONTRIBUTION OF MEDICAL IMPAIRMENT TO HIGHWAY CRASHES, DATA INDICATE THAT ONLY 3%-4% OF DRIVERS IN FATAL CRASHES DIED BECAUSE THEY HAD HAD A HEART ATTACK OR AN EPILEPTIC SEIZURE BEHIND THE WHEEL. HOWEVER, CONSIDERATION MUST BE GIVEN ALSO TO THOSE WITH HEART DISEASE OR OTHER CONDITIONS WHOSE PERFORMANCE HAS BEEN INADEQUATE TO MEET MORE THAN USUALLY DEMANDING DRIVING SITUATIONS WHICH MIGHT BE HANDLED SUCCESSFULLY BY A HEALTHIER PERSON. OTHER CONTRIBUTIONS OF MEDICAL IMPAIRMENT TO CRASHES MUST ALSO INCLUDE THE PROBLEM OF THE ELDERLY PEDESTRIAN WHO OFTEN IS HAMPERED BY DECREASED VISION, SLOWED LOCOMOTION, AND CONFUSION, AND THE DRIVERS AND PEDESTRIANS WITH ALCOHOL PROBLEMS WHO ARE ACUTELY INCAPACITATED BY ALCOHOL. EVEN IF THOSE WITH ALCOHOL ARE EXCLUDED, OTHER MEDICAL CONDITIONS PLAY A CONTRIBUTORY ROLE EITHER ALONE OR IN COMBINATION WITH ENVIRONMENTAL STRESSES IN THE INITIATION OF BETWEEN 15% AND 25% OF ALL CRASHES. DRIVERS AND PEDESTRIANS WITH ALCOHOL PROBLEMS APPEAR TO CONTRIBUTE TO THE INITIATION OF ABOUT ANOTHER 10% OF MINOR CRASHES AND A THIRD OF FATAL ONES. THE IMPLICATIONS FOR ACTION INCLUDE BROAD SOCIETAL RESPONSE AND CONTROL OF INDIVIDUALS IN WHICH THE MEDICAL PROFESSION PLAYS A UNIQUE PART. ISSUES INVOLVING SOCIETAL RESPONSE INCLUDE THE DEVELOPMENT OF PUBLIC TRANSPORTATION SYSTEMS WITH PARTICULAR EMPHASIS ON DESIGNING VEHICLES WHICH THE ELDERLY AND THE PHYSICALLY IMPAIRED CAN ENTER WITH EASE. ALSO INCLUDED IS GREATER ATTENTION IN VEHICULAR AND ROADWAY DESIGN AND CON-

STRUCTION TO THE LIMITS OF HUMAN ANATOMY AND PHYSIOLOGY SUFFICIENT TO MEET THE NEEDS OF ABOUT 95% OF THE DRIVING AND WALKING POPULATION VIRTUALLY ALL THE TIME. THERE IS RELATIVELY LITTLE THAT CAN BE DONE TO MODIFY THE WALKING HABITS OF ELDERLY PEDESTRIANS IN THE PRESENCE OF TRAFFIC. HOWEVER, IT IS URGED THAT PHYSICIANS RECOMMEND THE USE OF, AND POSSIBLY PROVIDE, REFLECTIVE MATERIALS TO ALL OF THEIR ELDERLY PATIENTS TO INCREASE THEIR VISIBILITY AT NIGHT. DRIVERS WITH POTENTIALLY IMPAIRING MEDICAL CONDITIONS SHOULD BE REPORTED TO THE LICENSING AGENCY FOR FURTHER EVALUATION WITH THE MAJOR EMPHASIS BEING PLACED ON SELFREPORTING, IDENTIFICATION THROUGH TESTING, AND IN-PERSON OBSERVATION BY LICENSE EXAMINERS AND, FOR ABUSIVE DRINKERS, SELECTION OF INDIVIDUALS WHO HAVE BEEN INVOLVED IN ALCOHOL-RELATED CRASHES OR OFFENSES ON THE HIGHWAY. REPORTING BY PHYSICIANS SHOULD BE USED ONLY AS BACK-UP TO THESE OTHER PROCEDURES; COMPULSORY REPORTING BY PHYSICIANS IS WARRANTED IF SEVERAL SAFEGUARDS ARE INCORPORATED INTO THE REPORTING SYSTEM AND ONLY IF THE PRIMARY RESPONSIBILITY FOR REPORTING RESTS WITH THE DRIVER.

by JULIAN A. WALLER  
 Publ: JOURNAL OF CHRONIC DISEASES V30 P393-400 (1977)  
 1977; 22REFS  
 PRESENTED AT WORKSHOP ON PHYSICIAN REPORTING OF DRIVER LIMITATION--VOLUNTARY OR COMPULSORY?, ATLANTA, 24 FEB 1975.  
 Availability: SEE PUBLICATION

HS-023 367

### OHIO DRIVER'S HANDBOOK. REV. ED.

THIS HANDBOOK FOR DRIVERS IN THE STATE OF OHIO CONTAINS CHAPTERS ON THE FOLLOWING ASPECTS OF OPERATING A MOTOR VEHICLE AND TRAFFIC SAFETY: DRIVER LICENSING; VEHICLE REGISTRATION; VEHICLE EQUIPMENT; TRAFFIC LAWS; LOSING YOUR LICENSE; SIGNS, SIGNALS, PAVEMENT MARKINGS; MOTORCYCLES AND MOTORIZED BICYCLES; OTHER VEHICLES; SPECIAL CONDITIONS; AND PEDESTRIANS. PREFACED ARE INFORMATION ON WHAT TO DO IN CASE OF AN ACCIDENT, TIPS ON SHARING THE ROAD WITH BICYCLISTS, AND A MAP SHOWING STATE HWY. PATROL POSTS, WITH TELEPHONE NUMBERS. APPENDED IS A LIST OF DRIVER EXAMINATION STATIONS (COUNTY, CITY, ADDRESS, APPOINTMENTS (IN PERSON AND TELEPHONE NUMBERS), AND DAYS OPEN).

OHIO DEPT. OF HWY. SAFETY, 240 PARSONS AVE., COLUMBUS, OHIO 43205  
 1978; 112P  
 Availability: CORPORATE AUTHOR

HS-023 368

### THE IMPACT OF MANDATORY FUEL ECONOMY STANDARDS ON FUTURE AUTOMOBILE SALES AND FUEL USE

A BASIS FOR PROJECTING AND EVALUATING THE IMPACT OF MANDATORY FUEL ECONOMY STANDARDS AND GASOLINE TAXES ON AUTOMOBILE SALES AND FUEL USE IS PROVIDED. THE ANALYTICAL PROCEDURES ARE BASED ON EXPLICIT ESTIMATES OF THE COST TO IMPROVE THE TECHNICAL EFFICIENCY OF NEW CARS AND A BEHAVIORAL MODEL OF CONSUMER CHOICE OF CAR BY MARKET CLASS. ALTERNATIVE POLICIES ARE EVALUATED IN TERMS OF THEIR IMPACTS ON FUEL CONSUMPTION, SALES-WEIGHTED FUEL ECONOMY, AUTOMOBILE SALES, VEHICLE SCRAPPAGE, FLEET COMPOSITION AND VEHICLE MILES OF TRAVEL. INCREASES IN GASOLINE PRICES WERE FOUND TO HAVE CONSIDERABLE POTENTIAL IN TERMS OF REDUCING AUTOMOTIVE FUEL CONSUMPTION, BUT ONLY AT THE EXPENSE OF CREATING EQUALLY SIZABLE DROPS IN VEHICLE MILES OF TRAVEL AND IN THE NUMBER OF AUTOMOBILES SOLD. FUEL ECONOMY STANDARDS, SUCH AS THOSE EMBODIED IN THE ENERGY POLICY AND CONSERVATION ACT (ENACTED IN DEC 1975 AND REQUIRING AUTOMANUFACTURERS TO MEET SPECIFIC FUEL ECONOMY STANDARDS BEGINNING IN 1978), ALSO APPEAR TO HAVE A SIGNIFICANT BENEFICIAL EFFECT ON FUEL CONSUMPTION, BUT WITH RELATIVELY LITTLE IMPACT ON AUTOMOBILE SALES AND TRAVEL. HOWEVER, EARLY INDICATIONS SUGGEST THAT THE STANDARDS INCORPORATED IN THE EXISTING LEGISLATION MAY BE UNATTAINABLE AND THAT REVISIONS IN BOTH THE STANDARDS AND THE PENALTY STRUCTURE MIGHT PRODUCE BETTER RESULTS.

by DAMIAN J. KULASH; CARMEN DIFIGLIO  
 JACK FAUCETT ASSOCIATES, INC.; FEDERAL ENERGY ADMINISTRATION, WASHINGTON, D.C.  
 1977; 49P 8REFS  
 PREPARED FOR PRESENTATION AT 56TH ANNUAL MEETING OF TRANSPORTATION RES. BOARD, WASHINGTON, D.C., 24-28 JAN 1977.  
 Availability: CORPORATE AUTHOR

HS-023 369

### STATISTICAL FILES, COMMONWEALTH OF MASSACHUSETTS, 1976 [MOTOR VEHICLE ACCIDENTS AND TRAFFIC]

DATA ON MOTOR VEHICLE ACCIDENTS IN MASSACHUSETTS IN 1976 ARE CLASSIFIED ACCORDING TO MONTH, TYPE (COLLISION AND NONCOLLISION), BOTH RURAL AND URBAN), COLLISION CONDITION, DAY OF WEEK AND HOUR OF DAY, FREQUENCY BY MILES, LOCATION, AGE AND SEX OF OPERATOR, PERSONAL INJURY BY MONTH COMPARED WITH PREVIOUS FIVE YEARS, EXISTENCE OF TRAFFIC CONTROL DEVICES, VEHICLE MOVEMENTS, OPERATOR VIOLATIONS, AND WEATHER, LIGHT, AND ROAD CONDITIONS. STATISTICS ON DEATHS ARE PRESENTED BY MONTH, BY MONTH IN A TEN-YEAR SUMMARY, AND FREQUENCY BY MILES. THE I

JURED ARE CATEGORIZED BY AGE AND SEX; BY MONTH AND BY MONTH ACCUMULATIVELY (FIVE YEARS); BY CLASSIFICATION (MOTOR VEHICLE OPERATOR OR PASSENGER, PEDESTRIAN, BICYCLIST) AND BY AGE AND SEX; BY FREQUENCY OF MILES; PEDESTRIAN ACTIONS, AND SEVERITY OF INJURIES. ACCIDENTS, INJURIES, AND DEATHS ARE TABULATED FOR EACH COUNTY. IN ADDITION, DATA ARE PRESENTED ON FUEL CONSUMPTION BY MONTH FOR 1975 AND 1976, AND ON 1976 MILEAGE ACCIDENT INJURY FREQUENCIES (BY MONTH AND YEAR FOR 1976 AND BY YEAR FOR 1972-1975). A SUMMARY AND DETAILS OF 1976 ENFORCEMENT ACTIVITIES FOR RESIDENTS ARE GIVEN (LICENSES, REGISTRATIONS, AND RIGHTS TO DRIVE SUSPENDED OR REVOKED); FOR NONRESIDENTS ONLY TOTAL SUSPENSIONS AND REVOCATIONS ARE GIVEN. SUSPENSIONS AND REVOCATIONS IN LIQUOR CASES BY MONTH FOR 1967-1976 ARE DETAILED. TOTALS FOR PROSECUTIONS FOR VEHICLE OVERLOADING AND OF TAGS ISSUED FOR DEFECTIVE EQUIPMENT ARE INCLUDED.

COMMONWEALTH OF MASSACHUSETTS, REGISTRY OF MOTOR VEHICLES, BOSTON, MASS.  
1977; 53P  
Availability: CORPORATE AUTHOR

HS-023 370

#### DEVELOPMENT OF TECHNIQUES FOR INVESTIGATING ACCIDENT CAUSATION. FINAL REPORT

DISTRIBUTIONS OF UNDERSTEER COEFFICIENTS AND STEERING SENSITIVITIES WERE COMPUTED FOR AN OE (ORIGINAL EQUIPMENT) VEHICLE POPULATION, AN AT-RISK VEHICLE POPULATION, AND AN ACCIDENT-INVOLVED VEHICLE POPULATION TO DETERMINE IF THESE VEHICLE HANDLING PARAMETERS COULD BE INFLUENTIAL IN ACCIDENT CAUSATION. THE INFLUENCES OF IN-USE TIRE FACTORS (INFLATION PRESSURE AND TREAD DEPTH) AND IN-USE LOADING CONDITIONS (AS REFLECTED BY NUMBER OF OCCUPANTS) UPON UNDERSTEER AND STEERING SENSITIVITY WERE REFLECTED IN THE DISTRIBUTIONS CALCULATED FOR THE AT-RISK AND ACCIDENT-INVOLVED POPULATIONS. IT IS CONCLUDED THAT NO DIFFERENCES OF ANY CONSEQUENCE EXIST BETWEEN THE DISTRIBUTIONS OF EITHER UNDERSTEER OR STEERING SENSITIVITY AS CALCULATED FOR THE AT-RISK AND ACCIDENT-INVOLVED VEHICLE POPULATIONS. THIS CONCLUSION IS QUALIFIED BY THE FOLLOWING POINTS: IMPRECISENESS OF KNOWLEDGE OF THE EFFECTS OF INFLATION PRESSURE AND TREAD DEPTH ON TIRE STIFFNESS PROPERTIES, OMISSION OF THE EFFECTS OF MIXING OF TIRE SIZES AND CONSTRUCTIONS ON UNDERSTEER AND STEERING SENSITIVITY IN THE AT-RISK POPULATION, AND SOMEWHAT SMALL SAMPLE OF ACCIDENT VEHICLES (A TOTAL OF 218). APPENDED ARE DATA AND INFORMATION ON THE FOLLOWING: TIRE STIFFNESS CALCULATIONS; ROLL CAMBER RATE, FRONT ALIGNING MOMENT COMPLIANCE STEER AND ROLL COMPLIANCE; VEHICLE PARAMETER ASSEMBLY; METHODOLOGY TO DEFINE DISTRIBUTIONS OF IN-USE INFLATION PRESSURE,

TREAD DEPTH, AND LOADING; MAKE/MODEL DISTRIBUTION OF THE AT-RISK POPULATION; AND DOCUMENTATION OF THE COMPUTATIONAL ALGORITHMS EMPLOYED.

by LEONARD JOHNSON; LEONARD SEGEL  
UNIVERSITY OF MICHIGAN, HWY. SAFETY RES.  
INST., HURON PKWY. AND BAXTER RD., ANN ARBOR,  
MICH. 48109  
MVMA-361283  
Rept. No. UM-HSRI-78-4; 1978; 85P 24REFS  
REPT. FOR 1 JUL 1976-31 DEC 1977.  
Availability: CORPORATE AUTHOR

HS-023 371

#### MINNESOTA ALCOHOL AND TRAFFIC SAFETY PROGRAM. 1978 ED.

AN UPDATE OF INFORMATION RELATING TO THE ROLE OF ALCOHOL IN TRAFFIC CRASHES IN THE STATE OF MINNESOTA IS ORGANIZED IN THE FOLLOWING SECTIONS: EFFECTS OF ALCOHOL AND OTHER DRUGS, DRINKING DRIVER FATALITIES, MINNESOTA DWI (DRIVING WHILE INTOXICATED) STATUTES, LAWS IN OTHER STATES, LAWS IN OTHER COUNTRIES, HENNEPIN COUNTY ALCOHOL SAFETY ACTION PROJECT (ASAP), DWI CLINICS, CHEMICAL TESTING PROGRAM, LIQUOR CONSUMPTION IN MINNESOTA, AND SUMMARY AND RECOMMENDATIONS. AN ANALYSIS OF AVAILABLE STATISTICAL DATA FOR MINNESOTA INDICATES THAT, WITH THE EXCEPTION OF THE HENNEPIN COUNTY ASAP, LITTLE OR NO REAL PROGRESS HAS BEEN MADE IN SOLVING THE DRINKING DRIVER PROBLEM. BASED UPON THIS ANALYSIS, THE FOLLOWING RECOMMENDATIONS ARE MADE: AMEND MINN. STAT. SECTION 169.121 (1976), SUBDIVISION 2, BY ADDING NEW LANGUAGE AS FOLLOWS: "EVIDENCE OF REFUSAL TO PROVIDE SAMPLES OF BLOOD, BREATH OR URINE AS REQUIRED BY MINN. STAT. SECTION 169.123 (1976) SHALL BE ADMISSIBLE IN ANY PROSECUTION UNDER THIS SECTION;" AMEND THE IMPLIED CONSENT LAW BY ADDING NEW LANGUAGE THAT "ANY PERSON WHO IS DEAD, UNCONSCIOUS OR WHO IS OTHERWISE IN A CONDITION RENDERING HIM INCAPABLE OF REFUSAL SHALL BE DEEMED NOT TO HAVE WITHDRAWN THE CONSENT PROVIDED IN SUBDIVISION 2;" AND AMEND SUBDIVISION 2 OF THE IMPLIED CONSENT LAW TO REQUIRE A BLOOD, BREATH OR URINE TEST OF ALL SURVIVING DRIVERS IN CRASHES FATAL TO OTHERS. OTHER RECOMMENDATIONS INCLUDE THE FOLLOWING: AMEND MINN. STAT. SECTION 168.041 (1976), SUBDIVISION 3, TO PROVIDE THAT ANY PERSON CONVICTED OF VIOLATING 169.121 SHALL SURRENDER MOTOR VEHICLE REGISTRATION PLATES TO THE COMMISSIONER OF PUBLIC SAFETY; VIEW DWI NOT SOLELY AS A PUBLIC SAFETY ISSUE BUT RATHER AS ONE ASPECT OF A MAJOR PUBLIC HEALTH PROBLEM; PLACE MORE EFFORT ON THE PREVENTION OF ALCOHOLISM AND DRINKING PROBLEMS THROUGH IMPROVED AND EXPANDED PUBLIC INFORMATION AND EDUCATION PROGRAMS; IMPLEMENT A STATEWIDE PROGRAM SIMILAR TO THE HENNEPIN COUNTY ASAP TO INCREASE THE APPREHENSION AND REHABILITATION OF DRUNKEN DRIVERS; AND ENACT H.F. 1515/S.F. 804 WHICH



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WOULD STRENGTHEN EXISTING DWI AND IMPLIED CONSENT STATUTES. MINNESOTA STATUTES RELATING TO HIGHWAY SAFETY ARE APPENDED.

MINNESOTA DEPT. OF PUBLIC SAFETY, OFFICE OF TRAFFIC SAFETY, 207 TRANSPORTATION BLDG., ST. PAUL, MINN. 55155  
1978; 66P REFS  
Availability: CORPORATE AUTHOR

HS-023 372

**WASHINGTON STATE COMPREHENSIVE ALCOHOLISM PLAN. FISCAL YEAR 1978. ACTION PLAN AND APPENDICES**

THE STRUCTURE AND FUNCTIONS OF THE STATE, COUNTY, AND NONGOVERNMENTAL COMPONENTS OF THE WASHINGTON STATE ALCOHOLISM PROG. ARE PRESENTED, AS ARE DATA ON EXPENDITURES AND REVENUES, JUSTIFICATION FOR ALCOHOLISM SERVICES, A PROGRESS REPORT FOR FISCAL YEAR (FY) 1977 AND PLANS FOR FY 1978, AND AN ACCOUNTABILITY AND PROGRAM EVALUATION. INCLUDED ARE DESCRIPTIONS OF THE DEPT. OF SOCIAL AND HEALTH SERVICES, OFFICE OF ALCOHOLISM, CITIZENS' ADVISORY COUNCIL, COUNTY ORGANIZATION AND BOARDS, AND SUCH NONGOVERNMENTAL ORGANIZATIONS AS THE WASHINGTON STATE COUNCIL ON ALCOHOLISM, THE WASHINGTON ALCOHOLISM PROFESSIONAL STAFF SOCIETY, THE WASHINGTON INDIAN COMMISSION ON ALCOHOLISM AND DRUG ABUSE, AND PROGRAMS IN THE STATE'S UNIVERSITIES AND COLLEGES. STATE LAWS, RULES, AND REGULATIONS GOVERNING ALCOHOLISM SERVICES ARE DETAILED. THE PUBLIC AND PRIVATE ALCOHOLISM SERVICES AVAILABLE INCLUDE COUNTY PROGRAMS SUCH AS DETOXIFICATION AND RECOVERY HOUSE SERVICES, AND COMMUNITY ALCOHOLISM CENTER SERVICES, PROVIDING EDUCATION, CLIENT EVALUATION AND REFERRAL, OUTPATIENT TREATMENT, AND FOLLOW-UP COUNSELLING. SERVICES THAT CANNOT BE PROVIDED ECONOMICALLY OR EFFECTIVELY ON A COUNTY BASIS ARE PROVIDED BY THE STATE; THESE INCLUDE INPATIENT TREATMENT FACILITIES, LONG-TERM RESIDENTIAL CARE, COUNSELING, WORK IN THE STATE'S CORRECTIONAL INSTITUTIONS, AN OCCUPATIONAL ALCOHOLISM PROGRAM FOR STATE EMPLOYEES, AND THE NATIVE AMERICAN DETOXIFICATION CENTER FOR THE YAKIMA INDIAN NATION. APPENDICES CONTAIN COPIES OF APPLICABLE STATUTES, ADMINISTRATIVE RULES, PROGRAM STANDARDS, GUIDELINES, TREATMENT FACILITY LICENSING STANDARDS, REPORT FORMS AND CONTRACTS; INSTRUCTIONS FOR BUDGETING AND FISCAL REPORTING; A LIST OF APPROVED FACILITIES, AND OF THE MEMBERS OF THE COUNTY COMMISSIONERS, ADMINISTRATIVE BOARDS, AND ALCOHOLISM COORDINATORS; MEMBERS OF THE CITIZEN'S ADVISORY COUNCIL ON ALCOHOLISM AND EXTRACTS FROM ITS HANDBOOK; EXTRACTS FROM PROGRESS REPORTS OF PREVIOUS YEARS; THE ALCOHOLISM PORTION OF STATE TITLE XX PLAN FOR FY 1978; PROCEDURES FOR DEVELOPMENT OF ALCOHOLISM STANDARDS, RULES, AND REGULATIONS; A DESCRIPTION OF INVOLUNTARY

HSL 78-1

COMMITMENT PROCEDURES; EXTRACTS FROM THE INDIAN ALCOHOLISM PLAN; MEMBERS AND MINUTES OF THE TASK FORCE ON YOUTH AND ALCOHOL; A DRINKING-DRIVER PROGRAM BROCHURE AND A SUPERVISOR'S GUIDE FOR EMPLOYEE AND ALCOHOL PROBLEMS.

by MILO KURLE  
WASHINGTON STATE DEPT. OF SOCIAL AND HEALTH SERVICES, OFFICE OF ALCOHOLISM  
1978; 647P  
REPT. FOR 1 JUL 1977-30 JUN 1978.  
Availability: CORPORATE AUTHOR

HS-023 373

**ENGINEERING DESIGN HANDBOOK. ANALYSIS AND DESIGN OF AUTOMOTIVE BRAKE SYSTEMS**

THE ENGINEERING DESIGN HANDBOOK SERIES CONTAINS BASIC INFORMATION AND FUNDAMENTAL DATA USEFUL IN ANALYSIS, DESIGN AND DEVELOPMENT OF ARMY MATERIEL AND SYSTEMS. THE HANDBOOK TREATS THE BRAKING OF MOTOR VEHICLES SUCH AS PASSENGER CARS, TRUCKS, AND TRAILERS, BUT NOT SPECIALTY VEHICLES. THE ENGINEERING RELATIONSHIPS PRESENTED CAN BE APPLIED TO THE ANALYSIS OF ANY AUTOMOTIVE BRAKING SYSTEM, INCLUDING TANKS AND SPECIAL CARRIERS. THE TEXT IS STRUCTURED SO THAT IT CAN BE USED BY JUNIOR ENGINEERS WITH A MINIMUM OF SUPERVISION. CHAPTERS COVER FACTORS INFLUENCING STOPPING DISTANCE, BRAKING DYNAMICS, METHODS TO IMPROVE BRAKING CAPABILITY, AN OVERVIEW OF BRAKE SYSTEM DESIGN, THE MECHANICAL AND THERMAL ANALYSIS OF FRICTION BRAKES, AN ANALYSIS OF AUXILIARY BRAKES AND BRAKE FORCE PRODUCTION. IN ADDITION, CHAPTERS DEAL WITH TIRE/ROAD FRICTION, VEHICLE BRAKING PERFORMANCE, THE BRAKING OF VEHICLES EQUIPPED WITH FIXED AND VARIABLE RATIO BRAKING SYSTEMS, AND WHEEL-ANTILOCK BRAKE SYSTEMS. INCLUDED ARE SECTIONS ON THE DYNAMIC ANALYSIS OF BRAKE SYSTEMS, BRAKE SYSTEM FAILURE, TESTING OF VEHICLE BRAKE SYSTEMS, DESIGN APPLICATIONS, AND BRAKE SYSTEMS AND THEIR COMPONENTS.

by RUDOLF LIMPERT  
RESEARCH TRIANGLE INST.  
Rept. No. DARCOM-P-706-358; AD-A035 143; 1976; 256P  
REFS  
Availability: NTIS

HS-023 374

**POLICY FOR ROADS: ENGLAND 1978**

IN THE FIRST OF A NEW SERIES WHICH REPLACES THE PREVIOUS ANNUAL REPORTS, ROADS IN ENGLAND, THIS WHITE PAPER EXPLAINS THE POLICY FOR THE GOVERNMENT'S ROAD PROGRAM IN ENGLAND FOR 1978, AS PRESENTED TO PARLIAMENT BY THE SECRETARY OF STATE FOR TRANSPORT. THE NEED FOR ROADS (INDUSTRY AND COMMERCE, SOCIAL DEVELOPMENT, PERSONAL MOBILITY, ROAD AND THE ENVIRONMENT, ROAD SAFETY



PLANNING AND ASSESSMENT (THE NEW APPROACH, URBAN ROAD SCHEME, TRAFFIC FORECASTS, VALUE FOR MONEY, OPEN DECISIONS, HIGHWAY INQUIRIES); THE FUTURE ROAD PROGRAM; THE MAIN ELEMENTS OF THE TRUNK ROAD PROGRAM, REGION BY REGION, IN THE CONTEXT OF ECONOMIC, SOCIAL, AND ENVIRONMENTAL OBJECTIVES ARE CONSIDERED SEPARATELY. THE DISCUSSION CONCERNS THE NATIONAL ROAD SYSTEM OF SOME 6500 MILES WHICH LINKS THE MAIN CENTERS AND CARRIES OVER A QUARTER OF ALL THE COUNTRY'S TRAFFIC. AN APPENDIX GIVES A BRIEF OUTLINE OF THE DIFFERENT STAGES THROUGH WHICH TYPICAL HIGHWAY PLANS HAVE TO PASS. A MAP OF ENGLAND'S EXISTING AND FUTURE NATIONAL ROAD SYSTEM IS PROVIDED.

DEPARTMENT OF TRANSPORT, LONDON, ENGLAND  
Rept. No. CMND-7132; 1978; 64P 9REFS  
Availability: HER MAJESTY'S STATIONERY OFFICE,  
LONDON, ENGLAND 1.60 POUNDS

HS-023 375

**A MANAGEMENT SYSTEM FOR EVALUATING THE VIRGINIA PERIODIC MOTOR VEHICLE INSPECTION PROGRAM. SOFTWARE MANUAL AND IMPLEMENTATION PROCEDURES. FINAL REPORT**

THE VIRGINIA DEPT. OF STATE POLICE HAS BEEN ADMINISTERING A PROGRAM FOR THE BIENNIAL INSPECTION OF MOTOR VEHICLES SINCE 1932. IN 1971, A PROCEDURE OF SYSTEMATIC SAMPLING OF INSPECTION RECEIPTS WAS BEGUN TO DETERMINE STATE AVERAGES FOR SUCH ITEMS AS THE OVERALL RATE AT WHICH VEHICLES ARE REJECTED, AND THE FAILURE RATE FOR VEHICLES BASED UPON THE VARIOUS TYPES OF POSSIBLE DEFECTS. THESE AVERAGES OR "NORMS" ARE USED TO INCREASE THE EFFECTIVENESS OF QUALITY CONTROL EFFORTS BY ENABLING THE DEPARTMENT TO COMPARE AN INDIVIDUAL STATION'S INSPECTION INFORMATION TO THAT FOR THE STATE AS A WHOLE. IN 1974, THE DEPT. OF STATE POLICE REQUESTED ASSISTANCE FROM THE VIRGINIA HWY. AND TRANSPORTATION RES. COUNCIL TO DETERMINE THE NECESSARY SAMPLE SIZE FOR USE IN THEIR CURRENT QUALITY CONTROL SYSTEM. A SAMPLING PLAN INCLUDING THE PRINCIPLES OF RANDOM SAMPLING WAS PREPARED. IN ORDER TO IMPLEMENT THIS SAMPLING PLAN AND TO DEVELOP STRUCTURED DATA GATHERING PROCEDURES AND PROVIDE COMPREHENSIVE AND USEFUL INFORMATION FROM THE SAMPLE, A SYSTEM OF PROGRAMS WAS WRITTEN. THESE PROGRAMS WERE DESIGNED TO GUIDE THE DATA COLLECTION EFFORT, DETECT AND CORRECT ERRORS IN DATA GATHERING, ENSURE APPROPRIATE SAMPLING AND SAMPLE SIZES, PROVIDE INFORMATION ON THE QUALITY OF REPORTING ITSELF, AND PRODUCE A COMPREHENSIVE REPORT ON THE INSPECTION SYSTEM AS A WHOLE. THIS REPORT OUTLINES THE WORKINGS OF THE SYSTEM AS A WHOLE, PROVIDES DETAILED DESCRIPTIONS OF SYSTEM COMPONENTS, AND PROVIDES DETAILED

INSTRUCTION FOR USE OF THIS MANAGEMENT EVALUATION SYSTEM.

by J. L. KORF; PHILIP S. HARRIS  
VIRGINIA HWY. AND TRANSPORTATION RES.  
COUNCIL, CHARLOTTESVILLE, VA.  
Rept. No. VHTRC-78-R52; 1978; 56P 3REFS  
SPONSORED BY HWY. SAFETY DIV. OF VIRGINIA.  
Availability: CORPORATE AUTHOR

HS-023 376

**MOTOR VEHICLE GOALS BEYOND 1980: FROM THE VIEWPOINT OF THE COMMERCIAL USER**

THE FUTURE OF THE TRUCKING INDUSTRY IS DISCUSSED IN TERMS OF THE NATIONAL TRANSPORTATION POLICY, THE ENERGY PROBLEM, ENVIRONMENTAL ISSUES, AND TRUCK SIZES AND WEIGHTS. THE DIFFICULTY IN COMING TO ANY CONCLUSION ABOUT THE NATIONAL TRANSPORTATION POLICY IS REFLECTED IN THE LARGE NUMBER OF GOVERNMENTAL GROUPS WHICH ARE CURRENTLY STUDYING THE ISSUE. IN RELATION TO FUEL CONSERVATION, IMPROVED OPERATING PRACTICES, PRINCIPALLY THE 55 MPH SPEED LIMIT, AS WELL AS OVERCOMING OPPOSITION IN STATES THAT HAVE NOT CHANGED THEIR WEIGHT LAWS TO THE FEDERAL LIMIT AND HAVE NOT AUTHORIZED TWIN-TRAILERS, WILL AID THE TRUCKING INDUSTRY IN SAVING FUEL. THE INDUSTRY IS MOSTLY CONCERNED WITH THE ARGUMENT ABOUT FORCIBLY SHIFTING TRANSPORTATION TO WHAT IS ARBITRARILY CALLED "THE MOST FUEL-EFFICIENT MODE." ONE ASPECT IS THE DIESELIZATION OF ALL TRUCKS WHICH THE TRUCKING INDUSTRY QUESTIONS WITH REGARD TO ITS COST EFFECTIVENESS. A SECOND ASPECT IS THE ARBITRARY SHIFTING OF ALL FREIGHT OVER 500 MILES TO RAIL BY 1985, AND ALL FREIGHT OVER 250 MILES BY THE YEAR 2000; THIS SUGGESTION IS BASED ON THE PREMISE THAT FUEL EFFICIENCY SHOULD BE MEASURED BY BTU'S PER TON MILE. BUT IT IS POINTED OUT THAT IF YOU CARRY THIS THEORY TO ITS ULTIMATE CONCLUSION, IT IS FOUND THAT PIPELINES ARE MUCH MORE FUEL EFFICIENT THAN RAILROADS. IN ANY CASE, THE TRUCKING INDUSTRY BELIEVES THAT MOST OF WHAT THE FREIGHT TRUCKS TRANSPORT CANNOT BE HANDLED EFFICIENTLY BY RAIL. CONCERNING ENVIRONMENTAL ISSUES, COSTS ARE CERTAIN TO INCREASE, PLACING GREATER BURDEN ON PRODUCTIVITY. IT IS STRESSED THAT APPROVED TRUCK WEIGHTS (FEDERAL MAXIMUM GROSS WEIGHT OF 80,000 LBS) AND SIZES (65 FT DOUBLE-TRAILER COMBINATIONS) MUST BE PART OF A FORWARD-LOOKING TRANSPORTATION POLICY. TODAY THERE ARE 11 STATES THAT DO NOT ALLOW TRUCKS OF THIS WEIGHT ON THEIR

HIGHWAYS, AND 20 STATES THAT DO NOT PERMIT TRUCKS OF THIS LENGTH.

by ROBERT H. SHERTZ  
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ST., N.W., WASHINGTON, D.C. 20036  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
AUTOMOTIVE SAFETY (5TH) PROCEEDINGS,"  
WASHINGTON, D.C., 1978 P7-12  
1978  
PRESENTED AT THE CONFERENCE, CAMBRIDGE,  
MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 377

### **MOTOR VEHICLE GOALS BEYOND 1980: FROM THE STANDPOINT OF THE CONSUMER**

CONSUMER PROTECTION, AS IT IMPACTS THE TRANSPORTATION FIELD, IS DISCUSSED IN TERMS OF SUFFICIENT FUEL FOR THE NATION'S NEEDS, CLEAN AIR TO BREATHE, TRANSPORTATION WHICH IS EFFICIENT AND AS NONLETHAL AS POSSIBLE, A SUPPLY OF JOBS, AND AN INEXPENSIVE AND SAFE VEHICLE MAINTENANCE AND INFORMATION PROGRAM. PROBABLY THE MOST PRESSING CONCERN WITH WHICH THE NATION WILL HAVE TO DEAL IN THE NEXT FEW YEARS IS THE NEED FOR FUEL. ONE MEASURE TO CONSERVE FUEL IS THE ENERGY POLICY AND CONSERVATION ACT WHICH PRESCRIBES FUEL ECONOMY STANDARDS TO 1985. MASS TRANSPORTATION AND A SHIFT TO MORE FUEL-EFFICIENT VEHICLES SHOULD BE ENCOURAGED. MASS TRANSIT CAN, AND SHOULD BE, ENCOURAGED WHERE IT IS MOST EFFICIENT, WHERE PEOPLE AND THEIR CARS ARE CONCENTRATED. THE SHIFT TO MORE FUEL-EFFICIENT CARS SHOULD BE ACTIVELY ENCOURAGED THROUGH SUCH INCENTIVES AS THE GAS GUZZLER TAX NOW BEFORE CONGRESS. TO THE EXTENT CONSUMERS REALIZE HOW MUCH EXTRA WEIGHT AND UNNEEDED SIZE IN CARS ARE COSTING IN TERMS OF JOBS AND ENERGY INDEPENDENCE, THEY WILL SUPPORT MORE EFFICIENT AUTOMOBILES. HOWEVER, ANOTHER ASPECT OF CONSUMER ACCEPTANCE IS THE SAFETY FACTOR RELATED TO SIZE OF THE CAR. THERE IS A NEED FOR INCREASED AUTOMOTIVE SAFETY MEASURES NOW BECAUSE OF THE DOWNSIZING OF CARS AND THE ACCOMPANYING INCREASE IN RISK OF INJURY AND DEATH IN TRAFFIC ACCIDENTS. PASSIVE RESTRAINT SYSTEMS, SUCH AS AUTOMATIC SEAT BELTS AND AIR BAGS, IMPROVED BRAKING, INCLUDING MORE DISC BRAKES, AND ANTILOCK BRAKING SYSTEMS FOR PASSENGER VEHICLES ARE SUCH SAFETY FEATURES. ANOTHER MAJOR FACTOR IMPACTING THE AUTOMOTIVE FIELD IS CLEAN AIR, THE MAJOR TRADE-OFF IN THIS AREA BEING BETWEEN AUTOMOBILES AND FACTORIES. IN THE BALANCE, THE BURDEN ON THE AUTO INDUSTRY TO PROVIDE SOME NEW STATES WITH CARS TO MEET EXISTING CALIFORNIA EMISSION STANDARDS SHOULD BE VERY MUCH LESS THAN THE BURDEN ON FACTORIES, WHICH WOULD BE DENIED PERMITS, AND ON PEOPLE, WHO WOULD BE DENIED JOBS. THE FINAL MAJOR CATEGORY OF CONSUMER CONCERN RELATES IN SOME WAYS TO ALL THE OTHER FACTORS, SAFETY, ENVIRONMENT, AND ENERGY. THIS EN-

COMPASSES BOTH CONSUMER INFORMATION AND SELFHELP, AND THE ENCOURAGEMENT OF AUTOMOTIVE DESIGN WHICH WOULD MINIMIZE REPAIR EXPENSES. IMPROVED CRASHWORTHINESS REQUIREMENTS ARE NEEDED, AND CONTINUED AND EXPANDED INSPECTION/MAINTENANCE PROGRAMS ARE STRONGLY ENDORSED.

by BOB ECKHARDT  
U.S. CONGRESS, SUBCOMMITTEE ON CONSUMER  
PROTECTION AND FINANCE, WASHINGTON, D.C.  
20515  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
AUTOMOTIVE SAFETY (5TH) PROCEEDINGS,"  
WASHINGTON, D.C., 1978 P13-9  
1978  
PRESENTED AT THE CONFERENCE, CAMBRIDGE,  
MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 378

### **MOTOR VEHICLE GOALS BEYOND 1980: FROM THE STANDPOINT OF INDUSTRY**

FORECASTING ECONOMIC AND MARKETING ASPECTS OF THE AUTOMOBILE INDUSTRY IS DISCUSSED FROM THE AUTO MANUFACTURER'S POINT OF VIEW. MAKING PROJECTIONS IS DIFFICULT NOT BECAUSE OF AN INABILITY TO BUILD ECONOMETRIC MODELS BUT BECAUSE THE DYNAMICS OF THE MARKET, OF TECHNOLOGY, AND OF GOVERNMENT POLICY QUICKLY MAKE THE INDUSTRY'S EFFORTS OBSOLETE. HYPOTHETICAL SCENARIOS BASED ON THE ASSUMPTION THAT EVERYTHING WILL SUCCEED ARE NOT SATISFACTORY. FOR EXAMPLE, ONE RESEARCH STUDY USED A SCENARIO IN WHICH A 28 MPG AVERAGE FOR NEW CARS BY 1985 WAS ASSUMED; AND A NUMBER VERY CLOSE TO THIS, IN SPITE OF ALL THE DISCLAIMERS, BECAME THE LAW OF THE LAND. AS A CONSEQUENCE, THE ABILITY OF THE MANUFACTURER TO ADAPT TO CHANGING MARKET CIRCUMSTANCES HAS BEEN SEVERELY RESTRAINED. FOR THE MANUFACTURER WHOSE DESIGN EFFORTS MUST ANTICIPATE CHANGE BY ANYWHERE FROM THREE TO FIVE YEARS, THE RISKS INHERENT IN THIS APPROACH TO CONSERVATION ARE VERY CLEAR. THE MANUFACTURER MUST WORRY ABOUT WHETHER NEW TECHNOLOGY WILL WORK IN THE FIELD, THE EXTENT TO WHICH THE INCREASED COST IN DOLLARS OR VEHICLE UTILITY OR PERFORMANCE WILL IMPACT ON SALES, AND WHETHER THE CONSUMER WILL ACCEPT THE CHANGE AT ALL. THESE ARE THE REASONS WHY MANUFACTURERS HAVE USUALLY INTRODUCED NEW TECHNOLOGY GRADUALLY. IT IS A MAJOR STEP FROM THE BUILDING OF PROTOTYPES TO MASS PRODUCTION. IT IS AN EVEN LARGER STEP FROM ENGINEERING FIELD TESTS TO THE DAY-TO-DAY TESTING THAT OCCURS WHEN THE TECHNOLOGY IS MADE AVAILABLE TO THE PUBLIC. THE COST OF AN ERROR TO A STUDY GROUP IS SMALL AND MAY ONLY REQUIRE A NEW ASSUMPTION IN AN OLD SCENARIO. HOWEVER, THE COST TO THE MANUFACTURER AND ITS IMPLICATIONS FOR SOCIETY ARE POTENTIALLY STAGGERING. WHILE THE UNCERTAINTIES ASSOCIATED WITH NEW TECHNOLOGY AND EMISSIONS STANDARDS

ARE IMPORTANT UNKNOWNNS, THE MAJOR UNCERTAINTY, CUSTOMER ACCEPTANCE OF NEW PRODUCTS REQUIRED TO MEET FUEL ECONOMY STANDARDS, WILL REMAIN. FORECASTING AGGREGATE DEMAND AND MODEL MIX OFTEN MISSES THE MARK BY A SUBSTANTIAL MARGIN, EVEN IN PERIODS WHEN THE PRODUCTS ARE NOT SUBJECT TO MAJOR CHANGE IN RELATIVE COST, DESIGN, AND UTILITY. IF STANDARDS ARE ESTABLISHED AT LEVELS WHICH EXCEED THE ORDERLY DEVELOPMENT OF PRODUCT PROGRAMS AND FORCE THE INTRODUCTION OF HIGH-COST TECHNOLOGY OR OF PRODUCTS UNACCEPTABLE FROM SOME OTHER POINT OF VIEW TO THE CUSTOMER, THE RESULT COULD WELL BE A REDUCTION OF AUTO SALES, AND A RETENTION OF OLDER MODELS. STANDARDS WILL CONTRIBUTE TO NATIONAL ENVIRONMENTAL, SAFETY, AND FUEL CONSERVATION GOALS ONLY AS RAPIDLY AS THE NEW CARS REPLACE THE OLDER ONES.

by HENRY L. DUNCOMBE, JR.  
GENERAL MOTORS CORP.  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P21-8  
1978  
PRESENTED AT THE CONFERENCE, CAMBRIDGE, MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 379

### **MOTOR VEHICLE GOALS BEYOND 1980: FROM THE STANDPOINT OF SOCIETY**

THREE CONTINGENCIES FAVORABLE TO THE NATION'S ENERGY SUPPLY ARE OUTLINED. DURING THE NEXT DECADE, TECHNOLOGICAL BREAKTHROUGHS AND OPERATIONAL OR INSTITUTIONAL INNOVATIONS COULD DRASTICALLY CHANGE THE REQUIREMENTS FOR SYNTHETIC FUELS. ONE CONTINGENCY IS AN UNEXPECTED SUCCESS IN CONVENTIONAL PRODUCTION (I.E. INDUCED BY CHANGED PRICE EXPECTATIONS, IMPROVED TECHNOLOGY, OR CHANGED REGULATORY PROCEDURES). A SECOND POSSIBILITY ARE TECHNOLOGICAL BREAKTHROUGHS IN FINDING AND PRODUCING CONVENTIONAL OIL AND GAS (E.G. IN ANALYTICAL AND TECHNICAL MEANS FOR EXPLORATION, DRILLING, AND PRODUCTION). ANOTHER CONSIDERATION IS COMPETITIVE, CONVENTIONAL FUELS FROM UNCONVENTIONAL SOURCES (NATURAL GAS FROM THE GEOPRESSURIZED ZONES OF THE GULF COAST, FROM COAL DEPOSITS, FROM THE TIGHT SAND FORMATIONS OF THE ROCKY MOUNTAINS, AND FROM THE DEVONIAN AND OTHER EASTERN SHALES; AND OIL BY EXTRACTION FROM TAR SANDS AND HEAVY OIL DEPOSITS, AND BY IMPROVED TERTIARY RECOVERY). HOWEVER, RECENT ENERGY STUDIES ASSUME THAT NOTHING WORKS, I.E. THAT THE PROBABILITY OF ANY ONE OF VARIOUS UNCONVENTIONAL POSSIBILITIES EMERGING AS A SIGNIFI-

CANT FORCE IS LOW AND, THEREFORE, THAT NONE OF THEM WILL EMERGE.

by HERMAN KAHN  
HUDSON INST., QUAKER RIDGE RD., CROTON-ON-HUDSON, N.Y. 10520  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P29-42  
1978  
PRESENTED AT THE CONFERENCE, CAMBRIDGE, MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 380

### **METROCAR II: A SECOND GENERATION HIGHWAY CONCEPT FOR URBAN AREAS**

THE MANNER IN WHICH HISTORICAL NATIONAL POLICIES AND OTHER INSTITUTIONAL FACTORS IN THE DEVELOPMENT OF THE AUTOMOBILE/HIGHWAY SYSTEM CONTRIBUTED TO SPACE-INTENSIVE CHARACTERISTICS AND CONSEQUENT DELETERIOUS IMPACT UPON THE URBAN FABRIC OF EXISTING METROPOLITAN CENTERS IS DISCUSSED; AND METROCAR II, A SECOND GENERATION HIGHWAY CONCEPT FOR URBAN AREAS, IS PROPOSED. CERTAIN OUTSIDE FACTORS INFLUENCED THE HIGHWAY SYSTEM'S DEVELOPMENT TOWARD ITS SPACE-INTENSIVE CHARACTERISTIC (I.E. HIGHWAY LANE'S CAPACITY OF 2000 PERSONS PER HOUR VS. RAIL TRANSIT CAPACITY OF 40,000 TO 60,000 PER HOUR) AND THESE INCLUDE THE NONURBAN CHARACTER OF THE HIGHWAY PLANNING COMMUNITY, GROWTH IN CAR SIZE, AND NATIONAL POLICY. THE LARGER CITIES WITH THEIR VARIED SOCIAL AND CULTURAL POPULATIONS, COMPOUNDED BY THE CONSTRICTED RIGHTS OF WAY (ROW'S) OF WELL ESTABLISHED URBAN FABRICS AND HIGH DEVELOPMENT INTENSITIES, HAVE TRAFFIC ENVIRONMENTS IN WHICH CONVENTIONAL TRAFFIC MANAGEMENT TECHNIQUES ARE UNSATISFACTORY. THE TECHNIQUES OF MODERN HIGHWAY DESIGN AND TRAFFIC MANAGEMENT WERE DEVELOPED IN SUBURBAN AREAS, AND APPLIED ON A "RETROFIT" BASIS TO ESTABLISHED CITIES. AS IS NOW WELL RECOGNIZED, THE SCALE AND GEOMETRY OF THESE "RETROFIT" PROGRAMS HAVE BEEN INCOMPATIBLE WITH EXISTING URBAN FABRICS, AND MANY SUCH PROGRAMS HAVE BEEN ABANDONED. THE METROCAR SECOND GENERATION HWY. CONCEPT SHOWS HOW CURRENT TECHNOLOGY DEVELOPMENT PROGRAMS CAN BE EXPLOITED TO PRODUCE REDUCED IMPACT AND GREATER TRANSPORT EFFICIENCY. THE DEPT. OF TRANSPORTATION (DOT) AND OTHER AGENCIES' RESEARCH, CAPITAL CONSTRUCTION, AND REGULATORY PROGRAMS ARE PROVIDING THE MATRIX OF TECHNOLOGY FROM WHICH MAY BE DRAWN SPECIAL LANE TREATMENTS FOR EXCLUSIVE SMALLER VEHICLE USE PROVIDING GREATER ROW EFFICIENCY, INCREASED LEVELS OF SAFETY FOR OCCUPANTS OF SMALLER VEHICLES, GREATER FUEL EFFICIENCY, AND THROUGH THE INTRODUCTION OF WAYSIDE ELECTRIFICATION, EXPANDED USE OF ELECTRIC VEHICLES. SUCH SPECIAL LANE TREATMENTS ARE BELIEVED CAPABLE OF SUSTAINING

THE EXPANSION OF NECESSARY TRAVEL DEMAND, WHILE REDUCING ENERGY REQUIREMENTS AND EMISSIONS, AND CONTRIBUTING TO IMPROVED SAFETY.

by RONALD ADAMS  
PRATT INST., 31 BANK ST., NEW YORK, N.Y. 10014  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P133-55  
1978; 7REFS  
PRESENTED AT THE CONFERENCE, CAMBRIDGE, MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 381

#### **THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'S PROGRAM TO EVALUATE THE EFFECTIVENESS OF FEDERAL MOTOR VEHICLE SAFETY STANDARDS**

PROGRESS MADE IN ESTABLISHING THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION'S (NHTSA) PROGRAM (LAUNCHED IN 1976) TO EVALUATE THE EFFECTIVENESS OF THE FEDERAL MOTOR VEHICLE SAFETY STANDARDS BASED ON ACTUAL EXPERIENCE ON THE ROAD, IS REPORTED; AND A DISCUSSION OF THE IMPORTANT EVENTS LEADING TO THE FOUNDING OF THE PROGRAM, PROCEDURES DEVELOPED TO ADMINISTER THE PROGRAM, SPECIFIC ACCOMPLISHMENTS TO DATE, AND FUTURE PLANS IS PRESENTED. THE FIELD EVALUATIONS OF THE STANDARDS ARE TO ESTIMATE THE BENEFITS AND COSTS OF THE STANDARDS AND TO GUIDE MANAGEMENT DECISIONS ON REVISIONS TO EXISTING STANDARDS AND EXPLORATION AND IMPLEMENTATION OF NEW ONES. THE EVALUATIONS WILL FOCUS ON THE FOLLOWING TWO POINTS: MEASUREMENT OF THE REAL-WORLD PERFORMANCE OF VEHICLES EQUIPPED TO MEET THESE STANDARDS AND COMPARISON WITH THE COMPLIANCE TEST REQUIREMENTS OF THE STANDARDS, AND MEASUREMENT OF THE EXTENT TO WHICH THE STANDARD ACCOMPLISHES THE REDUCTION IN ACCIDENT FREQUENCY OR SEVERITY AND A COMPARISON OF THESE BENEFITS WITH THE ACTUAL COSTS OF THE SAFETY EQUIPMENT.

by WARREN G. LAHEIST  
NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, WASHINGTON, D.C. 20590  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P157-72  
1978  
PRESENTED AT THE CONFERENCE, CAMBRIDGE, MASS., 11-13 JUL 1977.  
Availability: IN HS-803 242

HS-023 382

#### **CURRENTLY AVAILABLE TECHNOLOGY THAT EXCEEDS THE POST 1980 GOALS FOR VEHICLE**

#### **DAMAGEABILITY, SAFETY, AND ENERGY CONSERVATION**

THE KINETIC SAFETY VEHICLE (KSV) BODY CONVERSION CONCEPT, A UNIQUE COMBINATION OF IMPROVED FLEXIBLE SKINS, FORMS, AND HIGH STRENGTH METALS IN A LIGHTWEIGHT VEHICLE BODY ENVELOPE THAT IS READILY ADAPTABLE TO THE MASS-PRODUCED ECONOMY CAR, IS DISCUSSED. A DESIGN PROTOTYPE IS A MODIFIED 1971 PINTO. THE UNIQUENESS OF THE APPROACH APPEARS TO BE IN THE EXPANDED USE AND ADVANCED COMBINATION OF KNOWN MATERIALS DEVELOPED INTO A COHESIVE METHOD OF UPGRADING CONVENTIONAL MASS-PRODUCED CARS TO PERFORMANCE LEVELS PREVIOUSLY DECLARED UNATTAINABLE. BUMPERS, BUMPER MOUNTS, FENDERS, AND GRILLS WERE REPLACED BY A BODY ENVELOPE OF FOAM AND METAL. THE FLEXIBLE SKINS AND METAL STRUCTURES, ALONG WITH THE FOAM, INCREASE SYNERGISTICALLY THE VEHICLE'S ENERGY-ABSORBING CAPABILITIES. CRASH WORTHINESS AND FUEL ECONOMY ARE IMPROVED AND THE FRONT END IS LESS AGGRESSIVE WHEN HITTING PEDESTRIANS OR CYCLISTS. THERE IS NO PRACTICAL OR REASONABLE REASON WHY CURRENT TEMPORARY 28 MPG MINICARS AND SUBCOMPACT CARS CANNOT BE UPGRADED TO ELIMINATE THE SAFETY INEQUITIES. COLLISION CONTROL, PARTICULARLY IN SPEED RANGES UP TO 20 MPH (BEHIND BARRIER EQUIVALENT VELOCITY), CAN BE SYNONYMOUS WITH DAMAGE CONTROL. THE NEW DIMENSIONS IN FREEDOM OF CHOICE OFFERED BY THE KSV APPROACH CAN BE IN THE HANDS OF THE GENERAL PUBLIC ON A MASS PRODUCTION BASIS IN A MATTER OF MONTHS.

by DONALD W. JENSEN  
VICOM INTERNATIONAL, INC., VEHICLE DESIGN  
RES., 200 PARK AVE., SUITE 303 EAST, NEW YORK, N.Y. 10017  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P371-404  
1978; REFS  
PRESENTED AT THE CONFERENCE, CAMBRIDGE, MASS., 11-13 JUL 1977.  
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HS-023 383

#### **EVALUATION OF NEW INSTRUMENTS FOR MEASUREMENT OF DIFFERENTIAL CRASH VELOCITY AND FOR SENSING THE THRESHOLD OF CRITICAL CRASH INTENSITY**

A SIMPLE, MECHANICAL, AIR-DAMPED, VISCOUS FLOW CRASH RECORDER/SENSOR CONCEPT WAS EVALUATED IN LABORATORY SLED AND VEHICLE CRASH TESTS. TESTING WAS PERFORMED IN 12-MPH TO 30-MPH SPEED RANGES. LABORATORY TESTS WITH BOTH THE SENSOR AND THE CRASH RECORDER PRODUCED EXCELLENT CORRESPONDENCE WITH DIRECT MEASUREMENTS, ALTHOUGH TO A LARGER DISPERSION THAN THAT MEASURED WITH ACCELEROMETERS. VEHICLE TESTS OF CRASH RECORDERS YIELDED GOOD AVERAGE CORRESPONDENCE WITH THE MEASUREMENTS MADE WITH A

CELEROMETERS. HOWEVER, THE DISPERSION OF PERFORMANCE IN INDIVIDUAL CRASH RECORDERS IN THE 12-MPH TO 15-MPH IMPACT SPEED RANGE IS CONSIDERABLY HIGHER THAN AT THE 30-MPH LEVEL, RENDERING THEM MARGINAL AT THIS STAGE OF DESIGN FOR APPLICATIONS AT LOW LEVELS OF IMPACT. THE SENSOR TESTS ALSO YIELDED INCONCLUSIVE RESULTS DUE TO ITS BREAKAGE AT THE 30-MPH LEVEL AND THE LACK OF SIGNAL AT THE 12-MPH AND 15-MPH IMPACT SPEEDS. FURTHER LABORATORY AND VEHICLE TESTS ARE NEEDED TO EVALUATE THE CONCEPT'S ABILITY TO PRODUCE USEFUL MEASUREMENTS AND SIGNALS IN THE OFF-CENTER IMPACT CONFIGURATION AND TO TEST FOR ENVIRONMENTAL AND TIME-FACTOR EFFECTS.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
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HS-023 384

### PRECISION AUTOMOTIVE SERVICING

UNTIL RECENT YEARS, THERE HAS BEEN LITTLE NEED FOR CONCERN ABOUT THE CAPABILITIES OF THE SERVICING INDUSTRY IN VEHICLE MAINTENANCE AND REPAIR, AS THE PROFICIENCY OF MOST SERVICING BUSINESSES HAS GENERALLY BEEN ADEQUATE. UNDER INCREASING DEMANDS FOR GREATER OPERATING EFFICIENCY, SAFETY, AND EMISSION CONTROLS IN MOTOR VEHICLES, AUTOMOBILES HAVE BECOME VERY COMPLEX AND SOPHISTICATED MACHINES, AND ACCORDINGLY, MUCH MORE DEMANDING IN THEIR SERVICING REQUIREMENTS. NOW THE DEMANDS FURTHER TO IMPROVE AUTOMOBILE OPERATING EFFICIENCIES HAVE BEEN STEPPED UP CONSIDERABLY DUE TO THE POTENTIAL FUEL SUPPLY PROBLEMS, AND ONE RESULT OF THIS IS THAT MORE TECHNOLOGICAL ADVANCES AND INNOVATIONS ARE BEING INCORPORATED IN AUTOMOBILES. HOWEVER, DUE TO THE INCREASINGLY FINER TOLERANCES AND OPERATING SPECIFICATIONS, THE SENSITIVITY OF MANY CARS TO MALFUNCTIONS HAS BECOME MORE CRITICAL. FOR EXAMPLE, EMISSION CONTROL MALFUNCTIONS CAN CAUSE ENGINES TO BECOME UNTRACTABLE AND ALSO WASTEFUL OF FUEL IN SOME VEHICLE DESIGNS. HOWEVER, AT PRESENT IT APPEARS THAT FEW AUTOMOBILES ARE MAINTAINED WITHIN THEIR DESIGNED OPERATING SPECIFICATIONS. PART OF THE PROBLEM IS IN THE SHORTAGE OF SKILLED MECHANICS. MANY EXPERIENCED MECHANICS DO NOT FULLY UNDERSTAND ENGINES AND THE ELECTRONIC EXOTICA, AS WELL AS OTHER ADVANCED SYSTEMS, FOUND IN THE MORE RECENT MODELS. THE GARAGE EQUIPMENT PROBLEM IS EVEN MORE ACUTE. EXTENSIVE EQUIPMENT UPGRADING WILL

BE NECESSARY IF INCREASINGLY COMPLEX AUTOMOBILES ARE TO BE ADEQUATELY MAINTAINED. IT HAS BEEN FOUND THAT ADVANCED ELECTRONIC DIAGNOSTIC EQUIPMENT AND OTHER EXPENSIVE APPARATUS ARE LARGELY BEYOND THE FINANCING CAPABILITIES OF MOST OF THE SERVICING BUSINESS. THE AUTOMOTIVE SERVICE INDUSTRY, THROUGH SPECIALIZATION, IS MOVING TOWARD MORE PRECISION SERVICING. SPECIALIZATION IN THE FORM OF FRANCHISE CHAINS WILL INCREASE SHARPLY, AND ECONOMIES OF SCALE AND STANDARDIZATION WILL GENERATE BETTER FINANCING CAPABILITIES. SPECIALIZATION WILL BECOME THE PREDOMINANT FACTOR IN MOST CRITICAL AUTOMOTIVE REPAIR WORK WITHIN TEN YEARS; AND MERGERS AND COMBINATIONS WILL DEVELOP, LEADING TO FULL-SERVICE CHAIN COMPANIES.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
AUTOMOTIVE SAFETY (5TH) PROCEEDINGS,"  
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### REGULATORY PROCESS IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS: THE MANUFACTURERS' VIEW

WHILE MOTOR VEHICLES HAVE BECOME THE MAINSTAY OF AMERICA'S MOBILITY AND A KEY ELEMENT IN ITS ECONOMY, THEIR INCREASING NUMBER AND GROWING USE HAVE GIVEN RISE TO A NUMBER OF ENERGY, ENVIRONMENTAL, AND SAFETY CONCERNS. IT HAS NOT BEEN DEMONSTRATED THAT MOTOR VEHICLE POLLUTANTS EMITTED BY 1975 AND LATER MODEL YEAR VEHICLES REPRESENT HEALTH PROBLEMS OF A SERIOUS NATURE; MOTOR VEHICLE MANUFACTURERS HAVE RESPONDED TO THE NATIONAL GOAL OF CLEANER AIR. DESPITE THIS PROGRESS, THE STANDARDS NOW REQUIRED BY LAW FOR 1978 MODELS ARE SO STRINGENT THAT THEY CANNOT BE MET ON A PRODUCTION-LINE BASIS, A FACT WHICH THE CONGRESS RECOGNIZES BUT NEEDS TO ACT IMMEDIATELY ON. HEALTH EFFECTS RESULTING FROM VEHICLE-RELATED NOISE ARE STILL BEING WIDELY DEBATED AND ARE AS YET UNDEMONSTRATED. CERTAINLY MOTOR VEHICLES ARE MAJOR CONSUMERS OF PETROLEUM, YET THEY ACCOUNT FOR ONLY 18% OF TOTAL U.S. ENERGY CONSUMPTION. IN RELATION TO OTHER RAW MATERIALS, 80%-90% OF OBSOLETE CARS ARE NOW RECYCLED FOR THEIR IRON AND STEEL CONTENT. THE FATALITY RATE PER 100 MILLION MILES DRIVEN DECLINED FROM 5.58 TO 3.30 IN THE PAST DECADE, WHICH IS LARGELY ATTRIBUTABLE TO SAFETY IMPROVEMENTS IN THE VEHICLE, USE OF PASSENGER RESTRAINT SYSTEMS, IMPROVED ROAD DESIGN, BETTER DRIVER TRAINING, AND EMERGENCY MEDICAL MEASURES. THE GOVERNMENT HAS A LEGITIMATE ROLE IN CONTROLLING THE CAUSES OF AIR AND NOISE POLLU-

TION, HIGHWAY ACCIDENTS, INJURIES, AND DEATHS, INCLUDING, WHEN APPROPRIATE, THE VEHICLE ITSELF. THE EXTENT TO WHICH GOVERNMENT ACTION MAY BE REQUIRED MUST CONSIDER THE FOLLOWING AS VIEWED BY ALL INTERESTED PARTIES IF SOLUTIONS ARE TO BE CONSTRUCTIVE: A PROVEN NEED; OBJECTIVE PRIORITIES; CAREFUL ANALYSIS; RELIANCE ON THE PRICE MECHANISM IN THE MARKETPLACE OR PRERULEMAKING DIALOG TO RESOLVE SOCIETAL CONCERNS; AND BETTER EDUCATION OF THE PUBLIC BY GOVERNMENT AND INDUSTRY.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P637-41  
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#### **A RETRO-ROCKET BRAKING SYSTEM FOR AUTOMOBILES**

A BRIEF HISTORY OF RESEARCH ON AIRBAG RESTRAINT AND RETRO-ROCKET BRAKES ILLUSTRATES THE BELIEF THAT IT IS BETTER FOR A VEHICLE TO BE STOPPED BY CONTROLLED DECELERATION THAN BY UNCONTROLLED DECELERATION. HIGHLIGHTS OF THE PATENT HISTORY OF SLOWING VEHICLES WITHOUT OR IN AUGMENTATION OF FRICTION BRAKES, WITH EMPHASIS ON RETRO-ROCKET BRAKES, ARE PRESENTED. RETRO-ROCKET BRAKES WERE DESIGNED FOR AN EXPECTED WORLD OF COMMON 100 MPH CAR TRAVEL. THE RETRO-ROCKET BRAKE HAZARDS OF HEAT, EXTERNAL FORCE (ON NEARBY CARS), NOISE AND CHEMICAL POLLUTION, FIRE, AND MALFUNCTION ARE DISCUSSED. IF THE SPEED LIMIT IS MAINTAINED AT 55 MPH, IF AIRBAG RESTRAINTS (PREFERABLY AIR SEATS) BECOME AVAILABLE, AND IF PASSENGER COMPARTMENTS ARE STRENGTHENED SO THAT ESSENTIALLY ALL CRASHES ARE SURVIVABLE AND SURVIVED, THEN RETRO-ROCKET BRAKES FOR CARS WILL NOT BE NEEDED. HOWEVER, EXPERIMENTATION SHOULD CLARIFY THEIR POTENTIAL USEFULNESS, PARTICULARLY FOR TRUCKS AND TRAINS, OR CARS IF EVER THEY TRAVEL AT HIGHER SPEEDS.

by CARL C. CLARK  
Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P759-71  
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#### **SYSTEM FOR LIMITED AUTOMOBILE SPEED**

AN AUTOMATED SPEED CONTROL SYSTEM FOR AUTOMOBILES HAS FOOT-OPERATED AND ACCELERATOR CONTROLS THAT CAN BE CONTROLLED (LIMITED BY AN EXTERNAL COMMUNICATION SYSTEM. THE EXTERNAL COMMUNICATION SYSTEM (PERMANENTLY EMBEDDED, ROADSIDE LOCATED OR PORTABLE) TRANSMITS SIGNALS ENCODED TO INDICATE THE SPEED LIMIT. THE SIGNAL RECEIVED BY A MOVING VEHICLE IS DECODED, DISPLAYED WITHIN THE VEHICLE, AND COMPARED WITH AN INTERNAL SIGNAL INDICATING THE VEHICLE'S CRUISING SPEED. THE VEHICLE'S SPEED WOULD BE AUTOMATICALLY LIMITED IF IT IS ABOVE THE SPEED LIMIT. THE CONTROL DEVICE ON THE VEHICLE INCLUDES MEANS TO INTERCONNECT THE THROTTLE OR POWER SUPPLY CONTROLLING ELEMENT OF THE ENGINE. ASSOCIATED WITH THE CONTROL MECHANISM IS A SMALL ELECTRONIC CONTROL ASSEMBLY HAVING A SOLID-STATE PRINTED CIRCUIT AND A SIMILAR MEMORY DEVICE COMBINED WITH A MECHANISM INDICATING THE VEHICLE CRUISING SPEED. THE OPERATION OF THE SYSTEM IS SUCH THAT, WHEN THE POSTED SPEED LIMIT IS EXCEEDED, THE THROTTLE MOVES TO IDLING POSITION; OR THE ENGINE POWER SUPPLY BECOMES CONTROLLED BY AN ACTIVATING SIGNAL. THE FOOT PEDAL OR OTHER CONTROL CANNOT ACTIVATE THE THROTTLE OR THE ENGINE POWER SUPPLY ABOVE IDLE POSITION UNTIL THE SPEED OF THE VEHICLE IS REDUCED TO BELOW THAT ESTABLISHED BY THE EXTERNAL SIGNAL. THE DRIVER WILL EXPERIENCE A SMOOTH DECELERATION.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS," WASHINGTON, D.C., 1978 P851-71  
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#### **COMMENTS ON REGULATORY PROCESSES IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980**

MEANS FOR GAINING PUBLIC SUPPORT FOR NATIONAL MOTOR VEHICLE GOALS BEYOND 1980 ARE BRIEFLY OUTLINED. PUBLIC SUPPORT FOR THIS NATIONAL GOAL PROGRAM NEEDS TO BE DEVELOPED BY DELIBERATE EFFORTS TO IMPROVE PUBLIC UNDERSTANDING. THESE EFFORTS SHOULD INCLUDE THE FOLLOWING: MAXIMIZE THE VOLUNTARY APPROACHES TO THE PROGRAM; ESTABLISH MULTIDISCIPLINARY VOLUNTEER "WORKING GROUPS" FROM GOVERNMENT, INDUSTRY, ACADEMIA, NEWS MEDIA, AND THE GENERAL PUBLIC; AND MAINTAIN CONSTANT AWARENESS OF THE IMPORTANCE OF INFORMED PUBLIC SUPPORT, CHARGING THE NE-

2 December 31, 1978

HS-023 391

MEDIA PARTICIPANTS WITH THE RESPONSIBILITY FOR ITS REALIZATION.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
AUTOMOTIVE SAFETY (5TH) PROCEEDINGS,"  
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### **FUTURE REGULATORY POLICIES IN RELATION TO THE AUTOMOBILE TRANSPORTATION SYSTEM**

WHILE THE SEVERE ECONOMIC CONSTRAINTS OF THE MARKETPLACE MUST NECESSARILY BE SATISFIED, SOCIETAL NEEDS FOR ENERGY CONSERVATION, SAFETY, AND ENVIRONMENTAL IMPROVEMENT HAVE OFTEN BEEN NEGLECTED OR NOT GIVEN SUFFICIENT EMPHASIS. FOR THIS REASON, IT HAS OFTEN BEEN NECESSARY TO ADOPT REGULATORY POLICIES. WHATEVER POLICIES ARE ADOPTED, IF THEY ARE TO BE EFFICIENT AND EFFECTIVE, THEY MUST RELATE TO REALISTIC AND ACHIEVABLE GOALS. ONCE GOALS HAVE BEEN ESTABLISHED, IT IS IMPORTANT TO CONSIDER ALL POSSIBLE WAYS TO ACHIEVE THESE OBJECTIVES. INSTEAD OF THE FREQUENT IMMEDIATE REACTION BY GOVERNMENT TO ADOPT REGULATIONS, THE FOLLOWING ALTERNATIVE APPROACHES SHOULD BE CONSIDERED: INFLUENCING THE MARKET WITH BETTER INFORMATION AND CONSUMER EDUCATION; EMPLOYING TAXES, SUBSIDIES, AND OTHER MONETARY INCENTIVES; UNDERTAKING DIRECT GOVERNMENTAL ACTION TO BE FINANCED BY FEDERAL APPROPRIATIONS; AND DELEGATING THE AUTHORITY AND RESPONSIBILITY FOR ACHIEVING GOALS TO THE STATE AND LOCAL AUTHORITIES. ONE MEANS THE CONGRESS HAS ADOPTED TO OBTAIN BETTER INFORMATION BEFORE MAKING LEGISLATIVE DECISIONS IS TO CONDUCT A "TECHNOLOGY ASSESSMENT." IN THE TRANSPORTATION AREA, THE OFFICE OF TECHNOLOGY ASSESSMENT (OTA) IS CURRENTLY CONDUCTING A TECHNOLOGY ASSESSMENT OF POTENTIAL CHANGES IN THE FUTURE USE AND CHARACTERISTICS OF THE AUTOMOBILE TRANSPORTATION SYSTEM BOTH IN THE NEAR TERM (TO 1985) AND IN THE LONG TERM (THE YEAR 2000 AND BEYOND). IN THE EXAMINATION, IN THE COURSE OF THIS TECHNOLOGY ASSESSMENT OF PAST AND CURRENT GOVERNMENT POLICIES RELATING TO THE AUTOMOBILE, IT HAS BEEN FOUND THAT THE EMPHASIS HAS BEEN ON THE MOTOR VEHICLE CHARACTERISTICS THEMSELVES; IT IS TIME TO CONSIDER THE USE OF THE AUTOMOBILE AS WELL. IF IT IS DECIDED THAT REGULATORY POLICIES ARE APPROPRIATE FOR OBTAINING GOALS, THE FOLLOWING SEVERAL IMPORTANT FACTORS NEED TO BE CONSIDERED BEFORE REGULATIONS ARE ADOPTED: DEVELOPMENT OF BETTER TECHNIQUES AND DATA FOR EVALUATING THE IMPACTS OF PROPOSED

REGULATIONS; CONDUCT OF BROAD AND EXTENSIVE PROGRAMS OF RESEARCH AND TESTING OF PROPOSED REGULATIONS WELL IN ADVANCE OF THE RULEMAKING ACTIVITY; EXPANSION OF PUBLIC PARTICIPATION IN CONSIDERATION OF REGULATIONS; AND PROVISION OF SUFFICIENT LEAD TIME TO ALLOW INDUSTRY AND THE PUBLIC TO ADJUST WITHOUT CREATING UNWARRANTED HARDSHIPS.

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Publ: HS-803 242, "INTERNATIONAL CONGRESS ON  
AUTOMOTIVE SAFETY (5TH) PROCEEDINGS,"  
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### **REGULATORY PROCESSES IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980--STATE AND PRIVATE SECTOR VIEW**

A large common ground is seen in traffic safety regulation between state regulators and the private-sector safety movement for the achievement of motor vehicle goals in the future. The following three regulatory issues of the day are singled out as important for the 1980's: maintenance of the 55 mph speed limit, extension of programs under which regulatory bodies and courts utilize educational programs such as the Defensive Driving Course, and maintenance of the basic regulatory pattern existing in the motor transportation industry. The need for private-sector participation in the formulation of safety regulatory policy and for the development of public support for policies adopted is emphasized. The single most important factor in the development and execution of regulatory processes in the traffic safety field in the 1980's is considered to be the strength and wisdom of the private sector's safety forces, with the National Safety Council occupying a key coordinating role.

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Publ: HS-803 242, "International Congress on Automotive Safety (5th) Proceedings," Washington, D.C., 1978 p889-93  
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### **REGULATORY PROCESSES IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980**

Three major areas of Federal regulation that have had a significant impact on the automotive servicing industry, especially on automobile dealers, are outlined. The first area is safety devices, the most troublesome aspect probably being the 1974 seatbelt interlock system. Owner acceptance of this system has been extremely negative. Owners have tried to disconnect the systems themselves and in the process disabled



their cars. Next they have turned to independent garages and service stations in order to have the devices disconnected, only to find that other items on the car (e.g. clocks, fuel gauges) became inoperable in the process. The final step was to have the car brought back to the franchise dealer where the only course of action was to reinstall the system. Eventually, because of the public outcry, dealers were permitted to disconnect the systems. With regard to bumper systems, there is a tremendous increase in frame and structural damage because of the new, heavier bumper reinforcements, as well as increased cost to the customer in body work repair. Concerning air bags, it is questioned whether it is going to be up to the franchise dealers to face the consumer's adverse reactions to these safety devices. Also, there will be increased costs of repairs to the car because of the airbag system and safety hazards to the mechanics. A second area of impact are Federal regulations regarding emissions. The number one owner complaint in this regard is the car stalling when backing out of driveways in the morning, which is related to the new leaner choke setting. The car could be made more driveable by modification of the emission control system, but this would be a violation of the law. The third area of concern is energy legislation. No matter how much the Environmental Protection Agency (EPA) tries to disclaim its published mpg ratings, the average owner accepts these figures as what he/she is going to get.

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### **AUTOMOTIVE PARTS: THE NUTS AND BOLTS OF SAFETY**

The effects of the regulatory process under the National Traffic and Motor Vehicle Safety Act of 1966 (Safety Act) upon the manufacture, distribution, sale, and installation of automotive parts are discussed. The four primary areas of concern for automotive parts makers under the Safety Act are as follows: potentially anticompetitive impact of the so-called "antitampering" provisions; the burgeoning administrative burdens caused by defect and noncompliance reporting, notification, recall, and recordkeeping; the inflationary impact of the extensive National Hwy. Traffic Safety Administration (NHTSA) programs on small, independent manufacturers; and the absence of leadership by NHTSA in securing uniform national implementation and enforcement of the Federal standards. Although there are no easy remedies for these problem areas, automotive parts makers see two key Federal programs by which NHTSA could contribute to achieving important safety goals. The first approach is the development of an integrated national program of comprehensive vehicle inspection, combining safety, emissions, and energy efficiency tests under an improved Federal/state partnership. The second approach is the development of guidelines for good manufacturing practices to assist regulated manufacturers in making responsible decisions in selecting their quality control procedures. There is the overriding need to get the Federal/state/industry partnership-in-safety back squarely on the track, coordinating an integrated attack on the problem areas and achieving safety at a cost the public can afford. The

Federal government should concentrate on setting and enforcing uniform standards, the state governments should concentrate on ensuring the safety of vehicle operation over its useful lifetime, and industry should be free to concentrate on building better products, at lower prices, for sale in a competitive marketplace.

by William A. Raftery

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HS-023 393

### **REGULATORY PROCESSES IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980**

The major problem facing regulatory policies today and in the future, from the viewpoint of the manufacturers and distributors of truck bodies and truck equipment, is the accurate recognition of the parties actually being regulated. The impression that the big-name chassis people produce trucks has always been, and most likely will continue to be, the truck body manufacturers' biggest obstacle. The majority of regulatory agencies fail to differentiate between a truck and a truck chassis. Generally speaking, all regulations are directed at the completed vehicle and not at the subassemblies. The truck body industry completes trucks and introduces them into commerce and, as such, must ensure that the completed vehicle are in total compliance with all the applicable regulations. The industry provides the needed expertise to modify a basic truck chassis into a specialized vocational unit (i.e. a dump truck or cement mixer). Regulations must take into account the manner in which trucks are completed. The products of the truck body and equipment manufacturers are a result of customer demand more than any other type of automotive product. Just as the vehicles produced by this industry are continually being revised and updated to increase their utility, all of the regulatory agencies must also police their own products (regulation in an effort to ensure that their final product will result in both a safe and an efficient vehicle.

by Byron A. Crampton

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Publ: HS-803 242, "International Congress on Automotive Safety (5th) Proceedings," Washington, D.C., 1978 p919-22 1978

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### **REGULATORY PROCESSES IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980**

Advocates of increased regulation in the areas of noise, emissions, and safety keep pushing for theoretical goals without regard to cost or practicality. The most flagrant example is considered to be the Federal Motor Vehicle Safety Standards

(FMVSS) 121 brake standard. While no one has yet estimated the dollars that have been wasted by the suppliers to the trucking industry, while the regulators have made changes caused by experimentation in the field, it is certain that the figure will finally be in the millions of dollars. This must eventually be recouped by the suppliers in costs to their customers. In addition, the added cost to the user for hardware that does not work, for additional maintenance, for down time, and for accidents, is completely out of proportion to any demonstrated benefit. The trucking industry has tried desperately to make this standard work, but its frustration has reached a point where it believes that the antilock feature should now be cancelled in its entirety. With respect to the noise and emissions fields, the trucking industry is in favor of reasonable regulations, but it believes that future goals in these areas are excessive and incapable of practical compliance. The trucking industry and its suppliers have been very active in a voluntary effort to conserve fuel, and it is hoped that regulators can resist the urge to remove this program from the voluntary area.

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HS-023 395

### **BREATH ALCOHOL SCREENING OF SUSPECTED DRUNKEN DRIVERS. APPLICATION OF ALCOLMETER FOR PRACTICAL FORENSIC PURPOSES**

The capacity of a new commercial device, Alcolmeter, to screen the blood alcohol concentration (BAC) by means of the breath test was studied. The subjects comprised 1000 suspected drunken drivers examined by forensic practitioners and 386 cases examined by the police. Alcolmeter is a pocket-size device 10 x 6.3 x 3 cm in size and 169 g in weight. The meter contains a sensor, a breath sampling valve, an amplifier, and a display meter. The sensor is a fuel cell developed specially for alcohol. The valve aspirates a volume of expired air, when activated; and the alcohol present in the sample is oxidized in the sensor giving an electrical signal. The magnitude of the signal has been shown to be in a linear relation to the concentration of alcohol. The alcohol level is displayed as BAC, and the maximum reading is developed within 30 seconds. The correspondence between the blood/breath results was determined to be good both in the forensic ( $r = 0.90$ ) and police ( $r = 0.81$ ) cases. However, some marked and numerous minor negative and positive breath/blood differences were found at various BAC's. When the breath test result remained less than 0.35 cent percent, the BAC never exceeded 0.50 cent percent; when the Alcolmeter reading was more than 2.1 cent percent, the BAC was always more than 1.50 cent percent. The present survey suggests that two Alcolmeter "limit values" could be applied for practical police and forensic purposes. Alcolmeter is an excellent device in praxis to reveal the obvious drunken drivers for the blood test and clinical examination, when specific attention has been paid to the calibration of the equipment and the quality of the breath sampling. However, the present results clearly show that with the

aid of this equipment it is not possible to obtain the definite evidence needed for law enforcement practice.

by Antti Penttila; Matti Kataja; Ralph Lindbohm; Heikki Sumuvuori

Publ: Blutalkohol v14 n6 p387-97 (Nov 1977) 1977; 13refs

Includes German summary.

Availability: See publication

HS-023 396

### **SEAT MOVEMENT RELATIVE TO THE PASSENGER COMPARTMENT--A POSSIBLE METHOD TO IMPROVE PASSENGER PROTECTION DURING FRONTAL IMPACTS**

It is theoretically demonstrated that a controlled seat movement relative to the passenger compartment will result in an improvement of passenger deceleration during vehicle frontal impacts. An adjusting device will release a relative movement of the seat and the restrained passenger, acting against driving direction, when the deceleration of the passenger compartment is inferior to a certain mean deceleration during the total duration of crash. This countermovement shall cause the tolerable high deceleration of the occupant in the first phase of the crash. The resulting "gained" distance in the car shall be used to reduce exceeding vehicle deceleration by a relative forward movement of the seat in the second phase. In order to assure the precise functioning, the actual deceleration of the occupant compartment has to be transformed by the control unit into a signal releasing the servo valve which furnishes the necessary pressure to the adjusting cylinder. The energy required can be taken from specially modified impact absorbers. To achieve the desired effect, it is necessary that the occupant be restrained relatively stiffly in the seat. This can be assured, for instance, by a belt system with a preloading device, i.e. an additional subsystem which could be integrated into the total adjusting system. At present only the first step toward the final solution of the problem has been taken. The next step must be the improvement of the system behavior in the case of frontal crashes, especially of the frequency curves of the filter and of the adjustment mechanism. The same applies to the adaptation to all possible crash situations in connection with the restraint system, which has not yet been treated. The proposed effect could be advantageous as a possible alternative for the most favorable design of the energy-absorbing zones of a vehicle, as an additional safety device for the occupants of heavy vehicles with relatively soft impact-absorbing zones in case of crashes against rigid obstacles, and in small vehicles with reduced interior space and consequently more frequent passenger impacts to the compartment interior.

by H.-H. Braess

Publ: Vehicle System Dynamics v5 n3 p127-45 (Oct 1976)

1976; 14refs

Availability: See publication

HS-023 397

### **THE INFLUENCE OF THE SUSPENSION SYSTEM ON MOTORCYCLE WEAVE-MODE OSCILLATIONS**

The nature of the interactions between vertical, pitch, and bounce modes, and the lateral modes of a large motorcycle (650 cc) were analyzed. The most significant finding of the analysis is that the natural frequency of the second vertical

mode, which is almost a pure pitching mode, approaches that of the weave mode for high forward speeds. At these speeds, the weave-mode damping is low, and if the suspension damping is also low, so that the pitch mode is only lightly damped, considerable interaction between the pitch and weave modes would be expected. Further, because the coupling between vertical and lateral motions increases with cornering, the interaction would be expected to be greater for the cornering motorcycle than for one traveling substantially in a straight path. If a motorcycle were set up in such a tuned condition, road roughness, which excites the vertical motions directly, would also excite the lateral motions, particularly when cornering; and it is apparent that good directional control of the machine by the rider will be impaired. There exists also the possibility of a combined weave/pitch mode becoming unstable when the weave mode alone is quite stable. For any reasonable loading condition, a coincidence, at some road speed, of a vertical motion natural frequency with that of the weave mode would be expected. With special purpose machines (e.g. racing machines set up for one particular rider in one particular riding configuration), designing the suspension springs so that the first and second vertical modes have natural frequencies near that of the weave mode at medium road speeds, where the weave mode normally is adequately damped, would seem ideal. With general purpose machines, however, the arrangement described would require springs considerably softer than those now common, and excessive suspension movements would be required to accommodate changes in loading, unless some form of adjustment, particularly at the rear, were provided. The undesirable interactions can be further minimized by designing the layout of the machine to give as much weave-mode damping as possible, and by providing adequate damping of the vertical motions by suitable design of the suspension dampers. The provision of fixed spring rates with adjustable rear dampers (by a hand wheel) may represent a good compromise between cost and effectiveness.

by R. S. Sharp

Publ: Vehicle System Dynamics v5 n3 p147-54 (Oct 1976)  
1976; 5refs

Availability: See publication

HS-023 398

## **AUTOMOBILE DIRECTIONAL CHARACTERISTICS AND DRIVER STEERING PERFORMANCE**

Driver steering performance in a simple circular lane-keeping task, as dependent on directional response characteristics of the vehicle, was measured. Response Surface Methodology (RSM) models of steering performance are presented. Several canonical variables describe the drivers' responses to vehicle changes. Clear-cut optimum vehicle characteristics cannot be determined, but certain combinations of vehicle characteristics are seen to be undesirable for various reasons related to theoretical mechanisms of driver steering control. From one conceptual point of view (i.e. in one class of driving situation), a low steering sensitivity and a long response time is a very poor combination. With respect to a different steering control mode, the deleterious effects of a long response time are compounded if the steering sensitivity is high. The philosophy evolved here, of considering the requirements of different steering control modes, should provide the basis for determin-

ing the best characteristics for each specific class of steering task.

by P. F. Sweatman; P. N. Joubert

Publ: Vehicle System Dynamics v5 n3 p155-70 (Oct 1976)  
1976; 25refs

Sponsored by Australian Road Res. Board.

Availability: See publication

HS-023 399

## **ANALYSIS OF FATIGUE PROCESS OF RUBBER VULCANIZATES**

The relationship between input energy (W) and hysteresis energy loss (H) during repeated deformation was analyzed with gum and filled-rubber vulcanizates. The elastomers employed were natural rubber, styrene-butadiene rubber, isoprene rubber, nitrile-butadiene rubber, ethylene-propylene-diene terpolymer, isobutylene-isoprene rubber, and butadiene rubber. It was recognized that H decreases more quickly with repeated deformation than W does. After a number of cycles, both W and H approach constant values. When these values are plotted against strain ( $\lambda$ ), curves similar in shape are obtained, regardless of the type of rubber. This is because the network chain is well relaxed. A group of the linear relationships between  $\log W$  and  $\log H$  was found with respect to N (number of deformations) and  $\lambda$ . Examining the parameters  $g_1$ ,  $g_2$ ,  $f_1$ , and  $f_2$  as functions of N and  $\lambda$  (material constants determined by the type of rubber matrix and the carbon black content), simple expressions were obtained for both the first deformation and after many cycles. At the latter state, the hysteresis ratio tends to be constant in the wide range of  $\lambda$ . The relationship between W and H at fatigue break is expressed with the same form of equation proposed by Grosch for the tensile break at the first extension.

by H. Hirakawa; F. Urano; M. Kida

Publ: Rubber Chemistry and Technology v51 n2 p201-14 (May-Jun 1978)

1978; 7refs

Availability: See publication

HS-023 400

## **STRENGTH OF ELASTOMERS. A PERSPECTIVE [REVIEW]**

The following types of elastomers and their corresponding sources of strength are discussed: single-phase, noncrystallizable (viscoelastic processes, molecular network, orientation of chains); filled, noncrystallizable (increased energy dissipation, deflection and bifurcation of microcracks, cavitation); crystallizable (formation and deformation of crystalline domains); and block copolymers (plastic domains). Single-phase noncrystallizable elastomers, all of which lack toughness, are considered first to introduce concepts about viscoelastic properties at large deformations and about fracture processes. The strength and extensibility of such elastomers are next discussed in terms of illustrative data. Attention is given to tough elastomers, beginning with rubber vulcanizates that crystallize under strain and including those that contain carbon black. The properties of several tough polyurethane and poly(urea-urethane) block copolymers are examined in detail, and their strengths are compared with those of other elastomeric block copolymers. Properties depend markedly on molecular and supermolecular structures and on test condi-

tions. High strength necessitates a dispersed phase. The lifetime of a specimen being stretched at a constant rate depends on its ability to dissipate energy. For a crack to grow, primary valence bonds must be broken. The network per se contributes to strength, although the contribution is small except when specimens are tested at elevated temperatures or in a highly swollen state. The significant source of strength in single-phase noncrystallizable elastomers is viscoelastic processes near the tip of a slowly growing crack. Another source of strength apparently comes into play when an elastomer is very lightly cross-linked and thus can be highly stretched. The two crystallizable vulcanizates are somewhat weaker than most of the segmented and triblock elastomers; and as a class, the triblock elastomers are somewhat stronger than the segmented copolymers. Plastic domains impart strength more effectively than do reinforcing particulate fillers. For a microcrack to grow sufficiently to become unstable, domains must be disrupted.

by Thor L. Smith

Publ: Rubber Chemistry and Technology v51 n2 p225-52 (May-Jun 1978)

1978; 86refs

Reprinted from Polymer Engineering and Science v17 p129-43 (1977).

Availability: See publication

HS-023 401

## SECONDARY TASK MEASUREMENT OF WORKLOAD AS A FUNCTION OF SIMULATED VEHICLE DYNAMICS AND DRIVING CONDITIONS

A driving simulator with a six-degree of freedom computer-generated display, a four degree of freedom physical motion system, and a three-channel sound system was used to determine the sensitivity of a secondary task to vehicle handling parameters and various driving conditions. Six subjects drove a simulated vehicle with normal automobile handling and another six drove with degraded handling (slow response). Steering ratio and disturbance level were adjusted within each set of six subjects. A secondary task consisting of reading random digits aloud from a single-digit dashboard display was used to assess workload. Using a technique similar to that of Knowles (1963) and McDonald (1973), it was found that workload increased significantly as disturbance level increased. Furthermore, workload increased significantly with degraded vehicle handling. In contrast, increasing steering ratio did not produce a significant change in workload. These results indicate that the secondary task method can be used to assess the major effects of simulated vehicle handling on driver workload. The secondary task used is directly transferable to test vehicles, and it allows the assessment of large changes in primary task difficulty even though direct primary task measurement may not be feasible or economical. Problems remain, however, in designing more sensitive secondary-task measures.

by Walter W. Wierwille; James C. Gutmann; Thomas G. Hicks; William H. Muto

Publ: Human Factors v19 n6 p557-65 (Dec 1977)

1977; 23refs

Supported jointly by General Motors Corp. and by Virginia Polytechnic Inst. and State Univ.

Availability: See publication

HS-023 402

## STEPCHILD OF AMERICAN PEDIATRICS: CHILD TRANSPORTATION SAFETY

Traffic accidents are the number-one killer of young Americans over the age of one. Body dimensions and proportions of children do not allow standard seat belts to be fitted securely; but when no specially designed restraints are available, children should be restrained with regular seat belts. Also, the rear seat is always safer than the front seat. The first safety standard for child restraint systems became effective in 1971, but the test requirements of this standard were very quickly shown to be inadequate. More than six years later, the preliminary proposal for a meaningful standard has yet to be issued. Fortunately, most car seat manufacturers have taken the initiative to market a wide choice of crashworthy devices, anticipating a safety standard based on "dynamic" crash criteria. In their role, pediatricians must not merely recommend to parents the use of crashworthy devices for their children, they must also try to explain that the protective properties of any restraint depend on parents doing their part. The parents must purchase child restraints that have been dynamically tested and proved to offer effective crash protection, and properly use the restraints on every trip. How the child accepts restraints depends directly on the consistent concern and discipline of the parents for the child's safety. Physicians for Automotive Safety has made child-restraint information available to health and safety professionals and to the public for many years. Other areas of concern involve the child pedestrian, transportation in school buses, bicycling, motorcycling, and use of mopeds. Involvement of the primary physician in providing direct patient education can be the most effective preventive medicine for the number-one killer of youth. The article reviews highway mortality and injury statistics, the first and second collisions of a crash, recommended vehicle improvements, and seat belts and air bags.

by Seymour Charles

Publ: Pediatric Annals v6 n11 p726(77)-741(101) (Nov 1977)

1977; 53refs

Availability: See publication

HS-023 403

## CASTINGS--A BETTER USE OF LIGHTWEIGHT METALS? [ENERGY AND WEIGHT SAVINGS IN AUTOMOBILES]

A comparison is made, by general examples, of the energy savings resulting from substituting cast aluminum for cast iron and wrought aluminum for steel in automobiles. In comparing the use of cast and wrought aluminum to reduce vehicle weight and energy consumption, cast aluminum is generally regarded as less energy intensive based on the extensive use of secondary aluminum in castings. Cast aluminum also offers potentially larger direct weight savings than wrought aluminum. However, increased use of aluminum in either cast or wrought form will require that the added demand be matched by a corresponding increase in primary aluminum production. Further, virtually all potential casting applications are in chassis parts which will generally yield less indirect weight savings than upper body applications of wrought aluminum. Despite these limiting factors, the substitution of cast aluminum for cast iron appears to compare favorably with the replacement of steel by wrought aluminum on the basis of general estimates of energy savings. In particular, the selective use of cast

HS-023 404

aluminum to reduce the weight of optional engines may offer opportunities to maximize weight and energy saving per unit of substitute material used.

by Joseph E. Hunter  
General Motors Res. Labs.  
Rept. No. SAE-770320; 1977; 8p 11refs  
Presented at International Automotive Congress and  
Exposition, Detroit, 28 Feb-4 Mar 1977.  
Availability: SAE

HS-023 404

**AD HOC STUDY OF CERTAIN SAFETY-RELATED  
ASPECTS OF DOUBLE-BOTTOM TANKERS.  
APPENDICES. FINAL REPORT**

THE SEVEN APPENDICES PRESENTED REPORT ON THE DIRECTIONAL BEHAVIOR OF ARTICULATED VEHICLES; TANKER ROLLOVER LIMITS; FULL-SCALE TESTS; PROFILE OF LARGE GASOLINE AND OIL TANKER CHARACTERISTICS AND USE PATTERNS IN MICHIGAN; MANEUVERABILITY CONSIDERATIONS; ESTIMATION OF THE RELATIONSHIP BETWEEN TANK VOLUME, ROLLOVER STABILITY, AND ROLLOVER ACCIDENT INVOLVEMENT; AND LOADS TO BE REACTED BY A MODIFIED DOUBLE-BOTTOM TANKER.

by R. D. ERVIN; P. S. FANCHER; T. D. GILLESPIE; C. B. WINKLER; A. WOLFE; C. MALLIKARJUNARAO; M. VERMA; R. NISONGER; T. MCDOLE; D. MINAHAN  
UNIVERSITY OF MICHIGAN, HWY. SAFETY RES.  
INST., HURON PKWY. AND BAXTER RD., ANN ARBOR,  
MICH. 48109  
MPA-78-002A  
Rept. No. UM-HSRI-78-18-2; 1978; 172P  
REPT. FOR 14 NOV 1977-7 MAY 1978. HS-023 240 IS  
FINAL REPORT. SPONSORED BY MICHIGAN DEPT. OF  
STATE POLICE, OFFICE OF HWY. SAFETY PLANNING.  
Availability: CORPORATE AUTHOR

HS-023 405

**MOTORCYCLE ACCIDENT INVESTIGATION 1975-  
1976. A TWO YEAR ANALYSIS OF MOTORCYCLE  
SAFETY IN UTAH**

IN THE STATE OF UTAH THERE WAS AN 8% INCREASE IN INJURY ACCIDENTS INVOLVING MOTORCYCLES IN 1976 OVER 1975; MOTORCYCLE FATALITIES DECREASED BY 19%. COMPARISONS CONCERNING INJURIES AND FATALITIES BETWEEN 1969 AND 1976 DEMONSTRATED THAT THE MOTORCYCLE IS NOT OVERREPRESENTED IN TERMS OF UTAH'S ACCIDENT PICTURE. THE MAJORITY OF MOTORCYCLE ACCIDENTS OCCUR AT TRAVEL AND IMPACT SPEEDS BELOW 35 MPH. DRIVING EXPERIENCE PLAYS A SIGNIFICANT ROLE IN CRASHES. PERCENTAGES OF INEXPERIENCED DRIVERS DECREASED CONSISTENTLY IN 1976. THE HIGHEST PROPORTION OF MOTORCYCLE CRASHES OCCURS WHEN THE MOTORCYCLE DRIVER IS BETWEEN 21 AND 30 YEARS OF AGE. IN 1975, THE MOST POPULATED REGION OF THE STATE (WASATCH FRONT, 85% POPULATION) WAS REPRESENTED BY THE GREATEST PROPORTION OF MOTORCYCLE CRASHES AND CONTINUED TO BE IN 1976, BUT TO A RELATIVELY LESS DEGREE. THE 1976

HSL 78-

SAMPLE DEMONSTRATED A SLIGHT INCREASE. THE NUMBER OF CRASHES IN RURAL AREAS. THE VAST MAJORITY OF MOTORCYCLE DRIVERS A NOT PROBLEM DRIVERS. LARGER MOTORCYCLES (250 CC OR MORE) ARE MORE HIGHLY REPRESENTED IN CRASHES. MOST CRASHES OCCUR DURING DAYLIGHT HOURS OF 6:00 A.M. TO 4:00 P.M. THE MOST PROMINENT ACCIDENT CIRCUMSTANCES ASSOCIATED WITH CRASHES, INJURIES, AND FATALITIES ARE SPEEDING, RECKLESS DRIVING, AND DRINKING; THE FORMER TWO CAUSES INCREASED IN 1976, WHEREAS DRINKING DECREASED. ANGRY TYPE COLLISIONS ARE BY FAR THE MOST PROMINENT TYPE OF MOTORCYCLE CRASH. MOST BODILY INJURIES OCCUR TO THE ARMS AND LEGS FOLLOWED BY TORSO INJURIES; THE LEAST REPRESENTED INJURIES ARE THOSE TO THE HEAD. SAFETY HELMETS ARE SIGNIFICANT WITH RESPECT TO HEAD INJURIES. THE MOST HIGHLY RELATABLE VARIABLE IN TERMS OF INJURY IS SPEED, THE INJURY SEVERITY BEING MOST PRONOUNCED AT TRAVEL SPEEDS OR IN SPEED LIMITS ABOVE 30 MPH. THE TYPE OF ACCIDENT MOST LIKELY TO RESULT IN SOME FORM OF BODILY INJURY IS THE COLLISION WITH A FIXED OBJECT. THE MAJORITY OF DRIVERS KILLED WHO WERE KNOWN NOT TO BE WEARING HELMETS, SUFFERED DEATH AS A RESULT OF HEAD INJURIES; CONVERSELY, THE MAJORITY OF DRIVERS KILLED WHO WERE KNOWN TO BE WEARING HELMETS DIED AS A RESULT OF MULTIPLE OR TORSO INJURIES. CONSIDERING UTAH'S PARTIAL HELMET USE LAW (ABOVE 35 MPH) THE RATE OF COMPLIANCE IS SIGNIFICANTLY HIGH. ALTHOUGH THERE WAS A SLIGHT DECREASE IN 1976. INDIVIDUAL SUPPORT FOR THE HELMET LAW IS QUITE HIGH; HOWEVER, EXPRESSIONS OF PUBLIC SUPPORT DECREASED IN 1976.

UTAH DEPT. OF PUBLIC SAFETY, HWY. SAFETY DIV.  
SALT LAKE CITY, UTAH 84104  
1977; 79P  
Availability: CORPORATE AUTHOR

HS-023 406

**METHODOLOGY FOR CALCULATION OF DIESEL  
FUEL TO GASOLINE FUEL ECONOMY  
EQUIVALENCE FACTORS**

A METHODOLOGY IS PRESENTED FOR CALCULATING ENERGY EQUIVALENCE CONVERSION FACTORS FOR FUEL ECONOMY OF DIESEL-FUELED PASSENGER VEHICLES RELATIVE TO GASOLINE-FUELED PASSENGER VEHICLES. THE FOLLOWING THREE ILLUSTRATIVE CASES WERE COMPUTED UTILIZING THE DEVELOPED METHODOLOGY: ONE REPRESENTS THE MAXIMUM PROCESS ENERGY SAVINGS, ONE WHERE THE RATIO OF DIESEL/GASOLINE FUEL PRODUCTION BECOMES 20%/80%, AND ONE WHERE DIESEL FUEL CONSUMPTION INCREASES BY ONLY 1% RELATIVE TO GASOLINE CONSUMPTION. THE THREE CASES PRODUCE NUMERICAL DIFFERENCES OF VARYING SIGNIFICANCE. UNTIL A LEGISLATIVE CLARIFICATION IS OBTAINED, IT IS ASSUMED THAT THE ENERGY POLICY AND CONSERVATION ACT REQUIRES THAT REAL (AS OPPOSED TO PROJECTED) ENERGY CONVERSION FACTORS BE UTILIZED. SINCE

THE CONVERSION FACTORS WILL BE USED ONLY BY THE DEPT. OF TRANSPORTATION (DOT) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) TO COMPUTE A MANUFACTURER'S AVERAGE FUEL ECONOMY, AND SINCE THE CURRENT DIESEL POPULATION IS TOO SMALL TO CALCULATE MEANINGFUL PROCESS ENERGY SAVINGS, IT IS RECOMMENDED THAT A CONVERSION FACTOR BASED ONLY ON DIFFERENCES IN HEATING VALUES BE UTILIZED IN THE NEAR-TERM. IN THE LONGER TERM, THE ACTUAL PRODUCTION RECORDS TOGETHER WITH CERTIFICATION APPLICATIONS WILL PERMIT MORE ACCURATE PROJECTIONS OF DIESEL SALES; AND IT IS RECOMMENDED THAT THE CONVERSION FACTORS THEN BE REVISED ANNUALLY REFLECTING BOTH HEATING VALUE DIFFERENCES AND PROCESS ENERGY SAVINGS.

by JOHN P. DEKANY  
ENVIRONMENTAL PROTECTION AGENCY, EMISSION CONTROL TECHNOLOGY DIV., ANN ARBOR, MICH. 48105  
Rept. No. PB-270 785; FE-76-01; 1976; 19P  
TECHNICAL SUPPORT REPT. FOR REGULATORY ACTION.  
Availability: NTIS

HS-023 407

#### PERFORMANCE DECREMENT DURING PROLONGED NIGHT DRIVING

IN TESTS OF VIGILANCE AND CONTINUOUS REPETITIVE WORK THERE IS CONSIDERABLE EVIDENCE THAT PERFORMANCE DECLINES AS A FUNCTION OF TIME. INITIAL DECREMENTS, OFTEN FOUND IN VIGILANCE TASKS, CANNOT BE ASCRIBED TO WHAT IS USUALLY CALLED FATIGUE, BUT RATHER REFLECT A CHANGE FROM A STATE OF HYPERVIGILANCE TO NORMAL VIGILANCE OCCURRING WITHIN THE FIRST HALF HOUR OF THE WORK PERIOD. STUDIES ON VERY LONG-TERM PERFORMANCE, IN PARTICULAR LONG-TERM DRIVING, HAVE GENERALLY FAILED TO SHOW PROGRESSIVE EFFECTS. THIS CASTS SOME DOUBT ON THE USUAL IMPLICIT ASSUMPTION THAT FATIGUE AND LONG-TERM WORK ARE UNIQUELY RELATED. IT IS PROBABLE THAT EFFECTS OF DECLINING DIURNAL RHYTHM, MONOTONY, AND ACCUMULATING LACK OF SLEEP ALSO CONTRIBUTE TO FATIGUE. IN AN ATTEMPT TO DEMONSTRATE PROGRESSIVE DECREMENT AN EXPLORATORY EXPERIMENT WAS CARRIED OUT WHERE THE EFFECTS OF LONG-TERM WORK, DECLINING DIURNAL RHYTHM, AND ACCUMULATING SLEEP LOSS CONVERGE. SUBJECTS CARRIED OUT A CONTINUOUS DRIVING TASK BETWEEN 10 P.M. AND 6 A.M., WHICH WAS PRECEDED AND FOLLOWED BY TWO DRIVING TESTS OF 45 MINUTES EACH. IN ANOTHER CONDITION THEY HAD ONLY THE PRE-TEST AND POST-TEST AND SLEPT IN BETWEEN. THE RESULTS SHOW PROGRESSIVE DECREMENTS OF PERFORMANCE ON SEVERAL PERFORMANCE MEASURES, INCLUDING LANE DRIFTING AND TWO SUBSIDIARY TASKS, REPORTING KILOMETRAGE AND REACTIONS TO CHANGE OF LIGHT. IN GENERAL CONSIDERABLE RECOVERY WAS OBSERVED IN THE POST-TEST. ALTHOUGH HEART RATE DECLINED AND HEART RATE VARIA-

BILITY INCREASED DURING THE LONG NIGHTLY SPELL, THERE ARE STRONG ARGUMENTS AGAINST RELATING HEART RATE AND FATIGUE. THE EFFECTS OF FATIGUE ON VARIOUS TYPES OF SKILLED PERFORMANCE SHOULD BE STUDIED. IT IS CONCLUDED THAT DRIVING ALL NIGHT, PROFESSIONALLY OR NOT, IS LIKELY TO INCREASE ACCIDENT RISK.

by J. B. J. RIEMERSMA; A. F. SANDERS; C. WILDERVANCK; A. W. GAILLARD  
INSTITUTE FOR PERCEPTION TNO, SOESTERBERG, KAMPWEG 5, P.O. BOX 23, NETHERLANDS ROYAL-DUTCH-ARMY-A74/KL/003  
Rept. No. IZF-1976-14; 1976; 25P 30REFS  
PUBLISHED IN PROCEEDINGS OF NATO SYMPOSIUM ON VIGILANCE II, RELATIONSHIPS AMONG THEORY, PHYSIOLOGICAL CORRELATES AND OPERATIONAL PERFORMANCE, ST. VINCENT, ITALY, 3-6 AUG 1976. SUMMARY ALSO IN DUTCH.  
Availability: CORPORATE AUTHOR

HS-023 408

#### HYDROGEN FUEL READY FOR BUS FLEET

A PRACTICAL SCHEME TO OPERATE A FLEET OF CITY BUSES ON HYDROGEN BEING STUDIED BY DAIMLER-BENZ FEATURES A DUPLEX GAS STORAGE SYSTEM USING A LOW-TEMPERATURE METAL HYDRIDE (TIFE, TITANIUM-IRON) FOR COLD STARTS AND WARM-UP OPERATION, AND A HIGH-TEMPERATURE ONE OF GREATER ABSORPTION CAPACITY (MG2NI, MAGNESIUM-NICKEL) FOR NORMAL RUNNING. THIS COULD GIVE THE VEHICLES A RANGE OF 400 KM ON ONE CHARGE. ASIDE FROM BEING A HEDGE AGAINST ANY CRITICAL SHORTAGE OF PETROLEUM FUELS, THE HYDROGEN PROJECT OFFERS ENVIRONMENTAL BENEFITS SINCE THERE ARE VIRTUALLY NO ENGINE EXHAUST EMISSIONS. ONLY MINOR ENGINE (STANDARD MERCEDES 2.3-L, FOUR-CYLINDER GASOLINE ENGINE) MODIFICATIONS ARE NEEDED, AND COMBUSTION EFFICIENCY AND PERFORMANCE ARE THE SAME AS, OR EVEN BETTER THAN, WITH GASOLINE. HYDROGEN IS FREELY AVAILABLE IN UNLIMITED QUANTITIES, CAN BE CHEAPLY PRODUCED BY ELECTROLYSIS OF WATER, AND WITH HYDRIDE STORAGE PRESENTS NO SAFETY PROBLEMS. NORMAL ENGINE HEAT ACTIVATES THE ON-BOARD HYDRIDE UNITS. AIR CONDITIONING OR HEATING COULD BE PROVIDED AS A BY-PRODUCT WITHOUT ANY ADDITIONAL EQUIPMENT OR POWER DRAIN, AND CAN FUNCTION EVEN WITH THE ENGINE STOPPED. IN ADDITION THERE IS THE POSSIBILITY OF RECOVERING WASTE HEAT FROM VEHICLES AT REFUELING DEPOTS AS A BONUS ENERGY SOURCE FOR THERMAL POWER STATIONS OR SPACE HEATING. IT IS CALCULATED THAT CONVERTING THE STUTTGART FLEET OF 300 BUSES, EACH COVERING 200 KM A DAY AND CONSUMING 60 L OF DIESEL OIL, TO HYDROGEN COULD MEAN A DAILY SAVING OF 12,000 L OF PETROLEUM FUEL, OR ABOUT 4.4 MILLION L (1.15 MILLION GALLONS) A YEAR.

by DAVID SCOTT  
Publ: AUTOMOTIVE ENGINEERING V86 N5 P78-81 (MAY 1978)  
1978  
Availability: SEE PUBLICATION

HS-023 409

**RETREADONOMICS 1978 [ECONOMICS OF TIRE RETREADING INDUSTRY]**

STATISTICAL DATA REFLECTING THE ECONOMIC OUTLOOK FOR THE TIRE RETREADING INDUSTRY FOR 1978 ARE PRESENTED. A 1% TO 1.5% ANNUAL INCREASE IN THE PASSENGER TIRE REPLACEMENT INDUSTRY CAN BE EXPECTED. THE MARKET TO WHICH A TIRE DEALER AND RETREADER MUST LOOK FOR GROWTH IS THE LIGHT AND HEAVY TRUCK MARKET, WITH A 5% INCREASE FORECAST. ALMOST ONE HALF OF ALL NEW REPLACEMENT PASSENGER TIRES WILL BE RADIALS, AND RADIALS ARE ALSO MOVING INTO THE TRUCK FIELD IN IMPRESSIVE NUMBERS (25% OF ALL LARGE TRUCK TIRES IN 1978, 30% IN 1979). WHILE 1977 WAS A DOWN YEAR, IT IS EXPECTED THAT 1978 WILL BE AN UP YEAR IN SPITE OF THE SLOW START. INDICATIONS ARE THAT CAR RETREAD UNITS WERE DOWN BY 800,000 IN 1977 AND WILL CONTINUE TO DROP IN 1978 BECAUSE OF THE SEVERE CASING SHORTAGE. ON THE OTHER HAND, LIGHT TRUCK AND HEAVY TRUCK TIRE RETREADING IS CONTINUING TO RISE AND SHOULD OFFSET THE DECLINE IN CAR TIRE RETREADING. APPROXIMATELY \$1,344,000,000 WORTH OF RETREADED TIRES WERE SOLD IN 1977; IN 1978, TOTAL SALES ARE EXPECTED TO INCREASE BY 8%, MOSTLY DUE TO PRICE INCREASES. ESTIMATES FOR 1978 BASIC PRODUCTION COSTS ARE AS FOLLOWS: RISE IN THE PER POUND COST IN PASSENGER RETREADING FROM 84 CENTS TO 92 CENTS, 9%; RISE IN PER POUND COST IN CONVENTIONAL TRUCK TIRE RETREADING FROM \$1.04 TO \$1.13, 8.6%; AND RISE IN PER POUND COST IN PRECURE RETREADING FROM \$1.64 TO \$1.79, 9%. BASIC COST INCREASES ARE EXPECTED IN ALL AREAS (TREAD RUBBER, LABOR, AND OVERHEAD EXPENSES); FOR OVERHEAD, THE PRIMARY COST INCREASES ARE HEAVIEST IN POWER AND INSURANCE.

by E. J. WAGNER

Publ: RETREADER'S JOURNAL V22 N5 P3-10 (MAY 1978) 1978

PRESENTED AT 21ST ANNUAL LOUISVILLE RETREADERS' CONFERENCE, 17 APR 1978.

Availability: SEE PUBLICATION

HS-023 410

**POWER FOR THE '80S [AUTOMOBILE ENGINES]**

LEADING CANDIDATES FOR REPLACING THE GASOLINE ENGINE ARE OUTLINED. ALL IN ALL, THE DIESEL ENGINE IS A STRONG CONTENDER, SINCE IT WILL USE ABOUT 25% LESS FUEL THAN A COMPARABLE GASOLINE ENGINE. BECAUSE THERE IS NO IGNITION SYSTEM, DIESELS ALSO TEND TO BE MORE RELIABLE. THE MUCH HIGHER COMBUSTION TEMPERATURES VIRTUALLY ELIMINATE UNBURNED HYDROCARBONS AND CARBON MONOXIDE. BECAUSE DIESELS HAVE TRADITIONALLY BEEN OVERBUILT TO HANDLE THEIR HIGHER COMPRESSION RATIOS, THEY CAN HAVE UP TO DOUBLE THE LIFE SPAN OF COMPARABLE GASOLINE ENGINES. BUT THE DIESEL GIVES OFF NITROUS OXIDE AS A BY-PRODUCT AT HIGH COMBUSTION TEMPERA-

TURES. THE VOLKSWAGEN (VW) DIESEL RABBIT IS THE PERFECT ILLUSTRATION OF THE NEW WAVE OF DIESEL CARS. METHANOL/ETHANOL ENGINES BURN TOTALLY CLEAN AND THEY HAVE A MUCH GREATER LIFE. ALSO, ANY GASOLINE-ENGINED CAR CAN BE CONVERTED TO RUN ON STRAIGHT METHANOL. THE MOST SERIOUS DRAWBACK TO METHANOL OR ETHANOL AS FUEL IS THE FACT THAT THERE IS HARDLY ENOUGH ALCOHOL AROUND TO SUPPLY EVEN 1% OF THE TOTAL NEED. THE ELECTRIC CAR CAN BE VERY SMALL AND VERY EFFICIENT BECAUSE AN ELECTRIC MOTOR IS SURPRISINGLY POWERFUL FOR ITS SIZE AND WEIGHT, BUT CURRENT BATTERY TECHNOLOGY IS STILL IN THE EDWARDIAN ERA. THERE IS A MASSIVE RESEARCH PROGRAM UNDERWAY, FINANCED BY THE GOVERNMENT, TO DEVELOP A PRACTICAL, LIGHTWEIGHT, LONG-LIVED, INEXPENSIVE BATTERY MADE FROM PLENTIFUL MATERIALS; YET THERE STILL WILL BE THE PROBLEM OF CREATING ENOUGH ELECTRICITY TO RECHARGE THE ELECTRIC CAR POPULATION. IN ORDER FOR ELECTRIC CARS TO BE PRACTICAL, A DOUBLING OF THE PRESENT PRODUCTION OF ELECTRICITY IS NECESSARY. A NUMBER OF MANUFACTURERS, MOST SUCCESSFULLY VW, HAVE PRODUCED HYBRID CARS (USING A GASOLINE ENGINE WHICH CAN BE POWERED BY METHANOL OR DIESEL FUEL, AND AN ELECTRIC MOTOR). THE BIG DRAWBACKS TO SUCH A HYBRID SYSTEM ARE SERIOUS POWER LOSSES EACH TIME THE ENERGY IS CONVERTED TO ANOTHER FORM. USED WITH A DIESEL OR METHANOL ENGINE, AND NICKEL-ZINC BATTERIES, THE HYBRID CONCEPT HAS A LOT OF PROMISE AS BEING THE MOST EFFICIENT AUTOMOBILE OF ALL. THE GAS TURBINE IS A DARK HORSE CANDIDATE AT BEST BECAUSE OF ITS HIGH COST. THE STIRLING ENGINE, AN EXTERNAL COMBUSTION ENGINE, DOES NOT HAVE A MEANS TO CONTROL THE PISTON SPEED SUITABLE FOR AUTOMOTIVE USE. HONDA CVCC IS THE MOST SUCCESSFUL STRATIFIED CHARGE ENGINE, BUT THIS TYPE OF ENGINE IS SIMPLY AN IMPROVED RECIPROCATING-TYPE GASOLINE ENGINE WHICH WILL NOT BE GOOD ENOUGH IN THE NEAR FUTURE. STEAM ENGINES ARE TERRIBLY INEFFICIENT. THE WANKEL ROTARY ENGINE WILL PROBABLY NOT EVEN SURVIVE THIS DECADE; IT SIMPLY CANNOT BE RAISED TO SIGNIFICANTLY BETTER EMISSION OR ECONOMY LEVELS THAN THE CONVENTIONAL PISTON ENGINE.

by RICH TAYLOR

Publ: MOTOR V149 N3 P38-41, 80-2 (MAR 1978) 1978; 1REF

Availability: SEE PUBLICATION

HS-023 411

**CARBURETION SERVICE**

THE AUTO MECHANIC IS ADVISED TO CHECK OUT THE IGNITION SYSTEM FIRST, WHEN A CAR IS BROUGHT IN BY AN OWNER COMPLAINING OF CARBURETOR PROBLEMS. IT IS A WELL KNOWN FACT THAT AT LEAST 50%, MAYBE EVEN AS MUCH AS 75%, OF OWNER CARBURETOR COMPLAINTS CAN BE CORRECTED WITHOUT TOUCHING THE CARBURETOR,



December 31, 1978

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WITH THE POSSIBLE EXCEPTION OF IDLE MIXTURE AND SPEED ADJUSTMENTS. ON LATE MODEL CARS IT IS DIFFICULT TO SEPARATE CARBURETOR PROBLEMS FROM DEFECTS RELATED TO THE IGNITION SYSTEM. TO GUIDE THE MECHANIC, A DECAL OF ALL TUNE-UP DATA IS ATTACHED TO THE SPLASH SHIELD OR SOME OTHER ACCESSIBLE AREA UNDER THE HOOD OF ALL VEHICLES BUILT SINCE 1968. IT LISTS THE CORRECT INITIAL ENGINE TIMING, IDLE SPEED, IDLE EXHAUST MIXTURE, AS WELL AS OTHER INFORMATION. ALL SPECS SHOULD BE CHECKED TO SEE IF THEY ARE CORRECT. INFORMATION IS GIVEN FOR CHECKING OUT CONTACT DWELL, IGNITION TIMING, SPARK PLUGS AND WIRING, DISTRIBUTOR SPARK ADVANCE, HEAT CONTROL VALVE, AND CARBURETOR-RELATED EMISSION CONTROL DEVICES.

by JOHN SAMANICH

Publ: MOTOR V149 N3 P43-5, 67-8, 78 (MAR 1978)  
1978

Availability: SEE PUBLICATION

HS-023 412

#### **SQUEAKING BY DISC BRAKES ISN'T A PERMANENT CONDITION. BUT HERE'S THE PERMANENT CURE**

THE PROBLEM OF TRYING TO ELIMINATE SQUEALS AND SQUEAKS FROM DISC BRAKE OPERATION IS COMMONPLACE. THE NOISE MOST OFTEN OCCURS AFTER THE PEDAL HAS BEEN APPLIED AND JUST BEFORE THE CAR STOPS ROLLING, AND IS CAUSED BY VIBRATIONS OF THE DISC BRAKE PAD AS IT IS FORCED AGAINST THE ROTOR. WHEN CERTAIN COMBINATIONS OF PAD, PAD FIT, AND ROTOR CONDITION COME TOGETHER THE DISC BRAKE CAN BE VERY NOISY. MANY DISC BRAKE NOISE PROBLEMS CAN BE SOLVED BEFORE BECOMING AUDIBLE, BY DOING A COMPLETE BRAKE JOB, STARTING WITH A THOROUGH INSPECTION OF THE ROTOR AND CALIPER. CALIPER HARDWARE CAN CONTRIBUTE TO SQUEAKS. OFTEN DISC BRAKE NOISE IS CAUSED BY A POOR FIT OF THE OUTER DISC BRAKE PAD TO THE CALIPER. THE PADS SHOULD BE FITTED SO THAT THE EARS ARE JUST A LITTLE SMALLER THAN THE WIDTH OF THE CALIPER. ONE OF THE MOST EFFECTIVE WAYS MANUFACTURERS HAVE FOUND OF REDUCING DISC BRAKE NOISE IS TO USE RIVETED INSTEAD OF BONDED PADS, SINCE ON RIVETED PADS THERE IS ALWAYS A SMALL SPACE BETWEEN THE PAD AND THE METAL BACKING PLATE TO ACT AS A CUSHION, WHICH CAN BE ENOUGH TO CHANGE THE VIBRATIONS. DAMPENING HELPS; ADDING A THIN PIECE OF GASKET MATERIAL TO THE BACK OF THE METAL PAD BACKING PLATE WILL BE ENOUGH TO CHANGE THE VIBRATION FREQUENCY. THE SAME THING CAN BE DONE BY COATING THE PAD BACK WITH AN ELASTOMERIC MULTIPOLYMER COMPOUND, OR BY SPRAYING A THIN FILM ONTO THE METAL BACKING PLATE BETWEEN THE PAD BACK AND THE CALIPER, JUST ENOUGH TO CHANGE

THE VIBRATIONS. THERE IS NO ONE CAUSE FOR DISC BRAKE NOISE, AND NO ONE CURE.

by BOB CERULLO

Publ: MOTOR V149 N3 P52, 55-6 (MAR 1978)  
1978

Availability: SEE PUBLICATION

HS-023 414

#### **PROBLEMS OF THE CARLESS**

IN ORDER TO ASSIST PLANNERS IN UNDERSTANDING THE DATA AGGREGATION AND ANALYSIS REQUIRED TO DEFINE THE PROBLEMS OF THE TRANSPORTATION DISADVANTAGED, A COMPREHENSIVE STUDY WAS UNDERTAKEN OF PEOPLE WHO HAVE LITTLE OR NO ACCESS TO A CAR. SURVEY TECHNIQUES AND PROBLEMS OF IDENTIFICATION ARE DISCUSSED; THE TRANSPORTATION DISADVANTAGED ARE DEFINED, AND A PROFILE OF THIS SEGMENT OF THE POPULATION IS PRESENTED, SORTED INTO CAR AVAILABILITY GROUPS AND BY SOCIOECONOMIC CHARACTERISTICS. A DISCUSSION ON THE DEVELOPMENT OF ACTIVITY AND MODE PRIORITIES BY SUBGROUPS IS PRESENTED. THE CHARACTERISTICS OF THE TRANSPORTATION SYSTEM, ESPECIALLY THE BUS SYSTEM, THE INFLUENCE OF THESE ON TRANSPORTATION DISADVANTAGEDNESS, AND HOW THE SYSTEM AFFECTS OPPORTUNITIES AVAILABLE TO INDIVIDUALS ARE EXPLORED. WITHOUT ACCESS TO A CAR TOO MANY PEOPLE FIND THAT ALTERNATIVE MEANS OF GETTING TO THE ACTIVITIES THEY DESIRE ARE DIFFICULT, COSTLY, TIME-CONSUMING, UNCOMFORTABLE, UNSAFE, UNDESIRABLE, INACCESSIBLE, OR SIMPLY INCONVENIENT. WHILE TRAVEL DIFFERENCES EXIST BETWEEN THE CARLESS AND NONCARLESS, THE DIFFERENTIAL IS NOT IN TOTAL TRIPS BUT IN ALLOCATION OF TRIPS TO VARIOUS ACTIVITIES AND THE DISTRIBUTION OF THESE ACTIVITIES. THE TRANSPORTATION DISADVANTAGED PROVIDE THEIR OWN ALTERNATIVE SOLUTIONS TO THE CAR FOR THEIR PRIORITY NEEDS. AS THE CAR BECOMES LESS AVAILABLE, WALKING BECOMES THE DOMINANT MODE OF TRANSPORTATION. SINCE MORE TIME IS SPENT ON TRAVELING, THE DISADVANTAGED SUBSTITUTE NONMONETARY FOR MONETARY COSTS. THE CARLESS ARE HETEROGENEOUS, DISPERSED OVER THE URBAN AREA, AND HAVE DISSIMILAR TRAVEL NEEDS; APART FROM THE WORK TRIP, TRANSIT DOES NOT ALWAYS SERVE THEIR NEEDS. TRADITIONAL TRANSIT IMPROVEMENTS SUCH AS MORE FREQUENT SERVICE, ROUTE CHANGES, AND SLIGHT COST REDUCTIONS WOULD NOT APPRECIABLY ALTER DEMAND. MORE NONTRADITIONAL SERVICE CHANGES MUST BE MADE: SUBSTANTIAL FARE REDUCTIONS; RELIABLE, HIGHLY FREQUENT, SCHEDULED SERVICE; AND SHORTENING OF TRAVEL TIME. SERVICE THAT APPROXIMATES THE CAR IS THE MOST ACCEPTABLE (E.G. DIAL-A-BUS). WALKING MUST BE MADE EASIER BY MEANS OF IMPROVED CROSSWALKS AND SIDEWALKS, AND MORE

SIGNALS, IMPROVEMENTS WHICH ARE PROBABLY THE LEAST CAPITAL-INTENSIVE.

by ROBERT E. PAASWELL; WILFRED W. RECKER  
STATE UNIV. OF NEW YORK AT BUFFALO, BUFFALO,  
N.Y.

1978; 210P 199REFS

SUPPORTED BY DEPT. OF TRANSPORTATION AND  
GREATER BUFFALO DEVEL. FOUNDATION. ONE OF  
PRAEGER SPECIAL STUDIES IN U.S. ECONOMIC,  
SOCIAL, AND POLITICAL ISSUES.

Availability: PRAEGER PUBLISHERS, 200 PARK AVE.,  
NEW YORK, N.Y. 10017

HS-023 415

### **ARKANSAS ALCOHOL AND HIGHWAY SAFETY 1973-1976**

STATISTICAL DATA ARE PRESENTED FOR ALCOHOL-RELATED TRAFFIC ACCIDENTS IN THE STATE OF ARKANSAS DURING 1973-1976. NO SIGNIFICANT DIFFERENCE WAS FOUND BETWEEN THE AGES OF DRIVERS INVOLVED IN ACCIDENTS IN WHICH ALCOHOL WAS A FACTOR AND THOSE IN WHICH ALCOHOL WAS NOT A FACTOR. ABOUT 80% OF THOSE DRIVERS INVOLVED IN ALCOHOL-RELATED ACCIDENTS WERE MALE, COMPARED WITH A MALE INVOLVEMENT OF 63% IN NONALCOHOL-RELATED CRASHES. FEMALE DRIVERS INVOLVED IN ALCOHOL-RELATED ACCIDENTS WERE 15% OF THE TOTAL, WHERE NON-ALCOHOL-RELATED ACCIDENTS SHOWED A FEMALE INVOLVEMENT OF 32%. WEEKENDS CONTINUED TO BE THE MOST LIKELY DAYS FOR AN ALCOHOL-RELATED ACCIDENT TO TAKE PLACE, WITH SATURDAY THE MOST LIKELY DAY. ABOUT 62% OF ALL ALCOHOL-RELATED CRASHES HAPPENED ON URBAN TRAFFICWAYS. FATAL ALCOHOL CRASHES, ON THE OTHER HAND, WERE FOUND TO BE THREE TIMES AS LIKELY TO OCCUR ON RURAL ROADS. FATAL AND INJURY ALCOHOL-RELATED CRASHES WERE EVENLY SPLIT BETWEEN RURAL AND URBAN ROADWAYS. CITY STREETS ACCOUNTED FOR ABOUT HALF OF THE URBAN FATAL AND INJURY ALCOHOL-RELATED CRASHES; U.S. ROUTES AND STATE HIGHWAYS ACCOUNTED FOR 24% AND 22%, RESPECTIVELY. OVER 50% OF ALL RURAL ALCOHOL-RELATED ACCIDENTS OCCURRED ON STATE HIGHWAYS, FOLLOWED BY U.S. ROUTES (27%).

by DONNA DEANE

ARKANSAS STATE DEPT. OF PUBLIC SAFETY, LITTLE  
ROCK, ARK. 72203

1977?; 16P 2REFS

Availability: CORPORATE AUTHOR

HS-023 416

### **EVALUATION OF A PROPORTIONAL SAMPLER FOR AUTOMOTIVE EXHAUST EMISSIONS**

THE EVALUATION OF A PROPORTIONAL SAMPLER TO ASSESS ITS VALUE AS A TOOL FOR USE IN AUTOMOBILE EMISSIONS RESEARCH WAS CONCERNED WITH THE SAMPLER'S ABILITY TO OBTAIN REPRESENTATIVE EXHAUST GAS SAMPLES FROM FOUR DIFFERENT AUTOMOBILES. NO ATTEMPT WAS

MADE TO ASSESS COMPREHENSIVELY THE EFFECT OF SAMPLE DEGRADATION. RESULTS FROM CONTINUOUS SAMPLE MONITORING VERSUS BAG SAMPLE ANALYSIS IMPLIED THAT THE RAW EXHAUST SAMPLE'S INTEGRITY DID NOT SIGNIFICANTLY DETERIORATE DURING THE TIME PERIOD BETWEEN SAMPLING AND ANALYSIS. THE TEST RESULTS INDICATE THAT MEASUREMENTS OBTAINED FOR HYDROCARBONS, CARBON MONOXIDE, NITROGEN OXIDES, AND CARBON DIOXIDE USING THE PROPORTIONAL SAMPLER ARE WITHIN 19%, 46%, 20% AND 14% RESPECTIVELY, OF MEASUREMENTS OBTAINED USING THE CONSTANT VOLUME SAMPLER. THE MAGNITUDE OF THESE DIFFERENCES RENDERS THE PROPORTIONAL SAMPLER UNACCEPTABLE AS A QUANTITATIVE RESEARCH TOOL IN ITS PRESENT CONFIGURATION, BUT IT SHOULD BE USEFUL FOR QUALITATIVE EMISSIONS TESTING. THE VORTEX FLOW METER WAS FOUND TO BE THE PRIMARY SOURCE OF ERROR WITHIN THE PROPORTIONAL SAMPLER. ALTHOUGH THE FLOW METER PERFORMED ADEQUATELY WHEN METERING NONPULSATING TYPE AIRFLOWS, RATHER SIGNIFICANT METERING ERRORS WERE OBSERVED WHEN OPERATING UNDER ACTUAL AUTOMOBILE EXHAUST FLOW CONDITIONS. NO DETAILED TESTS WERE CARRIED OUT TO DETERMINE WHAT SPECIFIC ASPECT OF ENGINE EXHAUST FLOW WAS ADVERSELY AFFECTING THE MEASUREMENT CAPABILITIES OF THE VORTEX METER, BUT IT IS RELATED TO GAS PULSATIONS. FUTURE WORK INVOLVING INTEGRATION OF VORTEX FLOW METERS INTO AUTOMOBILE EMISSION MEASUREMENT SYSTEMS SHOULD ATTEMPT TO RESOLVE THIS ENGINE EXHAUST FLOW METERING PROBLEM. OTHER TYPES OF FLOW METERS BEING CONSIDERED FOR USE IN EITHER PROPORTIONAL SAMPLERS OR CONTINUOUS MASS MEASUREMENT SYSTEMS SHOULD BE QUALIFIED IN TESTS USING ACTUAL ENGINE EXHAUST.

by PETER A. GABELE

ENVIRONMENTAL PROTECTION AGENCY,  
ENVIRONMENTAL SCIENCES RES. LAB., RESEARCH  
TRIANGLE PARK, N.C. 27711

Rept. No. EPA-600/2-77-236; PB-278 186; 1977; 30P 6REFS  
ENVIRONMENTAL PROTECTION TECHNOLOGY  
SERIES REPT.

Availability: NTIS

HS-023 417

### **IMPACTS OF MATERIAL SUBSTITUTION IN AUTOMOBILE MANUFACTURE ON RESOURCE RECOVERY. VOL. 1: RESULTS AND SUMMARY. FINAL REPORT**

PROBABLE CHANGES IN THE MIX OF MATERIAL USED TO MANUFACTURE AUTOMOBILES WERE EXAMINED TO DETERMINE IF ECONOMIC OR TECHNICAL PROBLEMS IN RECYCLING COULD ARISE SUCH THAT THE "ABANDONED AUTOMOBILE PROBLEM" WOULD BE RESURRECTED. FUTURE TRENDS IN MATERIALS COMPOSITION OF THE AUTOMOBILES WERE QUANTIFIED, AND POSSIBLE CONSTRAINTS RELATED TO MATERIAL CHARACTERISTICS, AVAILABILITY, AND PRICE WERE EXAMINED. THE AUTOMOBILE RESOURCE RECOVERY INDUSTRY WAS

December 31, 1978

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STUDIED IN TERMS OF ECONOMIC INCENTIVES FOR RECYCLING AND TECHNICAL OBSTACLES TO RECYCLING OF DEREGISTERED AUTOMOBILES. A MACROMODEL OF THE ECONOMY, THE ENVIRONMENTAL PROTECTION AGENCY-SPONSORED STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM (SEAS) MODEL, WAS USED TO STUDY OVERALL ECONOMIC AND ENVIRONMENTAL EFFECTS AND TO BRING TO LIGHT ANY SECONDARY EFFECTS THAT MIGHT BE IMPORTANT. THE MAJOR CONCLUSIONS ARE THAT AUTO HULKS ARE LIKELY TO BE IN GREAT DEMAND FOR RECYCLING, THAT THE BACKLOG OF ABANDONED CARS IN THE ENVIRONMENT WILL VERY LIKELY DISAPPEAR BY THE 1980'S, AND THAT CHANGES IN MATERIALS COMPOSITION OF AUTOS WILL ACCENTUATE THIS TENDENCY. VERTICAL INTEGRATION OF THE LARGER FIRMS IN THE INDUSTRY IS A LIKELY TREND AT BOTH THE INPUT (HULK COLLECTION, DISMANTLING, AND PREPARATION FOR SHREDDING) AND OUTPUT (NONFERROUS METALS SMELTING) ENDS OF THE CENTRAL HULK PROCESSING (SHREDDING) PART OF THE BUSINESS. OVERALL ECONOMIC IMPACTS OF THE VARIOUS AUTOMOBILE MATERIALS COMPOSITION SCENARIOS STUDIED WERE RATHER SMALL, ALTHOUGH EFFECTS IN PARTICULAR INDUSTRIES (IRON AND STEEL, ALUMINUM AND GASOLINE PRODUCTION), RELATIVE TO A BASE-CASE, NO-CHANGE IN MATERIALS COMPOSITION SCENARIO, WERE NOTICEABLE. IMPACTS ON THE NATIONAL ENVIRONMENT WERE NEGLIGIBLE. THE TOTAL QUANTITY OF SOLID WASTE WILL NOT BE AFFECTED, BUT ITS COMPOSITION WILL CHANGE SLIGHTLY.

by ROBERT W. ROIG; WILLIAM L. HENN; TOM JONES; MARC NARKUS-KRAMER; ROY RENNER; ANDREA L. WATSON; CAROLYN WEAVER  
INTERNATIONAL RES. AND TECHNOLOGY CORP.,  
1501 WILSON BLVD., ARLINGTON, VA. 22209  
EPA-68-01-3142  
Rept. No. EPA-600/5-007A; PB-257 542; 1976; 113P 46REFS  
SOCIOECONOMIC ENVIRONMENTAL STUDIES SERIES  
REPT. "TECHNOLOGY OF AUTOMOBILE CRUSHING AND SHREDDING," PRESENTED AT UNIV. OF WISCONSIN-EXTENSION, 16-17 OCT 1975.  
Availability: NTIS

HS-023 418

#### **IMPACTS OF MATERIAL SUBSTITUTION IN AUTOMOBILE MANUFACTURE ON RESOURCE RECOVERY. VOL. 2: APPENDICES A-E. FINAL REPORT**

FIVE APPENDICES DETAIL FUTURE MATERIAL COMPOSITION IN AUTOMOBILES, PROVIDE PROJECTIONS OF AUTOMOBILE SALES BY WEIGHT CLASS, AND DISCUSS THE AUTOMOTIVE USE OF PLASTICS AND RECYCLING POSSIBILITIES, AND SAFETY ASPECTS OF MATERIALS SUBSTITUTION, AND THE ENERGY

CONSEQUENCES OF CAR COMPOSITIONS AND WEIGHTS.

by ROY RENNER; ROBERT W. ROIG; T. JONES; C. WEAVER  
INTERNATIONAL RES. AND TECHNOLOGY CORP.,  
ARLINGTON, VA. 22209  
EPA-68-01-3142  
Rept. No. EPA-600/5-76-007B; PB-267 568; 1976; 167P REFS  
VOL. 1 IS HS-023 417.  
Availability: NTIS

HS-023 419

#### **WYOMING'S 1977 FATAL ACCIDENT FACTS [MOTOR VEHICLES]**

STATISTICAL INFORMATION IS PRESENTED ON FATAL TRAFFIC ACCIDENTS WHICH OCCURRED IN WYOMING DURING 1977, THE DATA OBTAINED FROM THE INDIVIDUAL'S ACCIDENT REPORT, THE INVESTIGATING OFFICER'S ACCIDENT REPORT, AND MISCELLANEOUS REPORTS FROM THE STATE'S MOTOR VEHICLE DIVISIONS AND NEWSPAPER ARTICLES. DURING THE YEAR 1977, THERE WERE 212 FATAL MOTOR VEHICLE ACCIDENTS IN THE STATE, AND THESE ACCIDENTS RESULTED IN 250 PERSONS KILLED, 230 PERSONS INJURED, AND AN ECONOMIC LOSS OF OVER \$33 MILLION. OVERALL, THE FATAL ACCIDENTS INVOLVED 577 PERSONS WITH ONLY 97 OF THESE UNINJURED. IN VIEW OF WYOMING'S CONTINUED GROWTH AND INCREASING MOTOR VEHICLE TRAFFIC, HIGHWAY DEATHS DECREASED SLIGHTLY FOR 1977, AFTER THREE CONSECUTIVE YEARS OF INCREASED TRAFFIC FATALITIES. FATALITIES ROSE 9.23% IN 1975 AND 22.07% IN 1976; THE DECREASE WAS 4.0% IN 1977. TABULATED DATA ARE CATEGORIZED AS INFORMATION RELATED TO THE ACCIDENT, THE PERSONS INVOLVED, AND THE VEHICLE. ACCIDENT DATA ARE CONCERNED WITH TYPES, LOCATIONS, CONDITIONS, CHARACTERISTICS, ALIGNMENT, GEOMETRICS, AND INJURIES AND FATALITIES BY HOUR, DAY, MONTH, AND COUNTY. DATA ON PERSONS DEAL WITH CONDITION OF OPERATORS, EJECTION, DEMOGRAPHICS, CAUSES OF DEATH, TYPES OF NONFATAL INJURIES, AND CHARGED DRIVER VIOLATIONS IN FATAL ACCIDENTS. AS FOR VEHICLES, DATA INCLUDE THOSE ON TYPES, DEATH BY TYPES, OWNERSHIP, SEAT-BELT USE, AND OWNERSHIP, DEFECTS, MILEAGE, MODEL YEAR, AND COLOR.

by D. G. PRUTER; R. C. SKIDMORE; G. W. STEEN; T. F. JONES  
WYOMING STATE HWY. DEPT., SAFETY ANALYSIS SECTION, P.O. BOX 1708, CHEYENNE, WYO. 82001  
1978; 48P  
Availability: CORPORATE AUTHOR \$2.00

HS-023 420

#### **METHANOL AS AN AUTOMOTIVE FUEL: A SUMMARY OF RESEARCH IN THE MIT**

ITION ENGINE HAVE DEMONSTRATED THAT METHANOL/GASOLINE BLENDS SHOW EMISSIONS AND EFFICIENCY CLOSELY COMPARABLE TO GASOLINE ALONE AND THAT THE BLENDS YIELD A SLIGHT EXTENSION OF THE LEAN LIMIT OF OPERATION. METHANOL ALONE SIGNIFICANTLY EXTENDS THE LEAN LIMIT OF OPERATION AND PERMITS OPERATION AT MUCH HIGHER COMPRESSION RATIOS WITH CORRESPONDING IMPROVEMENTS IN EFFICIENCY. HOWEVER, SUBSTANTIAL CHANGES TO CONVENTIONAL CARBURETION TECHNOLOGY WOULD BE REQUIRED TO OBTAIN ACCEPTABLE ENGINE START-UP CHARACTERISTICS. STUDIES OF THE PHASE STABILITY OF METHANOL/GASOLINE BLENDS HAVE QUANTIFIED THE TENDENCY FOR TRACES OF WATER TO CAUSE SEPARATION OF BLENDS INTO ORGANIC AND AQUEOUS PHASES, AS TEMPERATURE DROPS; THIS IS SHOWN TO BE A STRONG FUNCTION OF METHANOL CONTENT, WATER CONTENT, GASOLINE COMPOSITION, AND ADDED SOLUBILIZER FOR METHANOL/WATER. IT WAS FOUND POSSIBLE TO ENHANCE THE SOLVENT POWER OF GASOLINE WITH ADDITION OF VARIOUS SOLUBILIZERS SUCH AS T-BUTYL ALCOHOL AND BENZYL ALCOHOL, ALTHOUGH SIGNIFICANT QUANTITIES OF SOLUBILIZERS WERE NECESSARY IN SOME CASES. ADDITIONAL BASIC RESEARCH TO CHARACTERIZE METHANOL AS AN AUTOMOTIVE FUEL IS WORTHWHILE. THE PRIMARY QUESTION REGARDING ITS USE REMAINS ITS COST. THE QUANTIFICATION OF ITS PROPERTIES AS AN AUTOMOTIVE FUEL IS INCOMPLETE; ADDITIONAL RESEARCH WILL BETTER DEFINE ITS POTENTIAL AND ITS PROBLEMS. INFORMATION AND PROPOSAL ACTIVITIES OF THE METHANOL GROUP OF THE MIT ENERGY LAB. AND THE DEVELOPMENT OF A PROPOSAL FOR A FLEET TEST PROGRAM ARE DESCRIBED.

by RICHARD G. DONNELLY; JOHN B. HEYWOOD; JULES LORUSSO; FRANK O'BRIEN; THOMAS B. REED; RODNEY J. TABACZYNSKI  
MASSACHUSETTS INST. OF TECH., ENERGY LAB., 1-23 AMHERST ST., CAMBRIDGE, MASS. 02139  
Rept. No. PB-262 980; MIT-EL-76-013; 1976; 58P 27REFS  
SPONSORED IN PART BY A GRANT FROM MR. J. B. HAWLEY, JR., 1915 57TH AVE. N., MINNEAPOLIS, MINN. 55430.  
Availability: NTIS

HS-023 421

# **RESTRAINT SYSTEM USAGE SURVEYS: A LITERATURE REVIEW. 3RD ED.**

THIS LITERATURE REVIEW CONTAINS REFERENCES TO 59 SURVEYS CONDUCTED IN THE U.S. ON THE USAGE OF AUTOMOBILE PASSENGER RESTRAINT SYSTEMS. LISTED FIRST ARE THE REFERENCES, ARRANGED BY AUTHOR OR CORPORATE AUTHOR. SECONDARY TREATMENTS OF THE SAME SURVEYS HAVE BEEN OMITTED. THE SECOND SECTION GIVES, IN TABULAR FORM, SEATBELT, SHOULDER HARNESS, AND/OR CHILD RESTRAINT USAGE RATES AND SURVEY INFORMATION (YEAR OF STUDY, AREA OF

TIONS HAVE BEEN MADE REGARDING THE VALIDITY OF THE REPORTED STUDIES; HENCE, IT MAY BE NECESSARY TO REFER TO THE ACTUAL REPORT IN SOME INSTANCES, FOR CLARIFICATION.

by ANN C. GRIMM, COMP.  
UNIVERSITY OF MICHIGAN, HWY. SAFETY RES.  
INST., ANN ARBOR, MICH. 48109  
Rept. No. UM-HSRI-78-22; 1978; 16P  
Availability: CORPORATE AUTHOR

HS-023 422

# **REDUCING AUTOMOTIVE WEIGHT WITH THIN WALL ZINC [DIE CASTING]**

THIN WALL (MINIMUM WALL THICKNESS THAT WILL DO THE JOB REQUIRED) ZINC DIE CASTING HAS BEEN APPLIED TO THE MANUFACTURE OF AUTOMOBILES: HIGH QUALITY, THIN WALL COMPONENTS AND PRODUCTS CAN BE PRODUCED WITH LESS MATERIAL AND AT LOWER COSTS THAN EVER BEFORE POSSIBLE. THE IMPROVED TECHNOLOGY DEVELOPED FOR ZINC DIE CASTINGS IS CONSIDERED BY MANY TO BE THE BEST WAY FOR SUCH PRODUCTS TO BE COMPETITIVE WITH OTHER CHOICES OF MATERIALS. ADDED TO THE COST-SAVING ADVANTAGES IS THE FACT THAT THIN WALL CASTINGS CAN BE PRODUCED WITHOUT SACRIFICING THE FOLLOWING TRADITIONAL BENEFITS OF ZINC DIE CASTINGS: STRENGTH, UP TO 43,000 PSI IN SOME CASES; A DECREASE IN COMPONENT WEIGHT, AN IMPORTANT CONSIDERATION IN MANY PRODUCTS; THE ABILITY TO BE MASS PRODUCED; AND THE FLEXIBILITY OF DESIGNING LARGER, MORE COMPLEX PARTS THAN ARE POSSIBLE WITH OTHER CAST MATERIALS. PHYSICAL AND MECHANICAL PROPERTIES OF ZINC; DIE CASTING PROCESS PARAMETERS; APPLICATIONS OF THIN WALL ZINC TECHNOLOGY BY CHRYSLER, GENERAL MOTORS, AMERICAN MOTORS, AND FORD; AND A COMPARISON OF DESIGN, COST, AND PRODUCTION CONSIDERATIONS FOR PLASTIC INJECTION MOLDINGS AND THIN WALL ZINC DIE CASTING ARE DISCUSSED. COMPONENT PRICES OF PRODUCTS TO BE PRODUCED FROM EITHER PLASTIC OR ZINC MUST BE STUDIED IN DETAIL TO DETERMINE WHICH MATERIAL WILL PRODUCE THE LEAST MANUFACTURED COST. THERE ARE NO SIMPLE RULES TO GUIDE THE DESIGNER OR MATERIAL SPECIFIER SINCE EACH ELEMENT OF COST MUST BE INVESTIGATED FOR SPECIFIC PARTS OF COMPONENTS. IT IS NOT UNCOMMON FOR TWO PARTS, SIMILAR IN APPEARANCE AT A CASUAL LOOK, TO HAVE A CONSIDERABLE DIFFERENCE IN PRODUCTION COSTS. DETAILED COST ESTIMATES, BASED ON IN-DEPTH STUDIES OF THE ADVANTAGES OF EACH MATERIAL, SHOULD THEREFORE BE PREPARED FOR ZINC AND PLASTIC PARTS BEFORE THE FINAL DESIGN AND MATERIAL SELECTION DECISIONS ARE MADE. THEN THE APPROPRIATE DESIGN RULES FOR THE LOWEST

by DALE C. H. NEVISON  
ZINC INST., INC.  
Rept. No. SAE-770321; 1977; 16P 17REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 423

### **ALUMINUM LIGHTWEIGHT CASTINGS--SOME COST-SAVING IDEAS [AUTOMOTIVE INDUSTRY]**

ALUMINUM CASTINGS HAVE MUCH TO OFFER THE AUTOMOTIVE INDUSTRY IN TERMS OF WEIGHT REDUCTION AND ENERGY SAVINGS; BUT THEIR LONG-TERM ACCEPTABILITY CAN ONLY BE ASSURED BY APPLYING THE MOST COST-EFFECTIVE COMBINATIONS OF MATERIAL AND PROCESSING. HYPEREUTECTIC ALUMINUM/SILICON ALLOYS CAN CONTRIBUTE SIGNIFICANTLY TO ACHIEVING MAXIMUM ACCEPTABILITY OF ALUMINUM CASTINGS IN THE FOLLOWING WAYS: ELIMINATING A NEED FOR COSTLY FERROUS INSERTS IN WEAR-TYPE APPLICATIONS; ENABLING CONVERSION FROM IRON TO ALUMINUM WHERE A MACHINE-TOOL CAPITAL EXPENDITURE RESTRUCTION MIGHT HAVE OTHERWISE RULED CONVERSION OUT; AND MINIMIZING THE WEIGHT OF PARTS, BECAUSE OF SUPERIOR FLUIDITY AND STRENGTH. TWO MODERN PROCESSING METHODS, "PORE-FREE" DIE CASTING AND "LOW-PRESSURE" CASTING, SEEM TO OFFER THE POTENTIAL TO PRODUCE ALUMINUM CASTINGS WITH MINIMUM METAL USAGE AND CONSEQUENTLY LOWER PART COST AND ENERGY CONSUMPTION.

by JOHN L. JORSTAD  
REYNOLDS METALS CO.  
Rept. No. SAE-770322; 1977; 12P 12REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 424

### **MAGNESIUM: A PROVEN MATERIAL FOR LIGHT WEIGHT AUTOMOTIVE DIE CASTINGS**

MAGNESIUM DIE CASTINGS ARE EMERGING AS ONE OF THE MORE ATTRACTIVE CHOICES AVAILABLE FOR AUTOMOTIVE WEIGHT REDUCTION. DIE CASTINGS MADE FROM MAGNESIUM ALLOYS HAVE LOW DENSITY AND EXCELLENT STRENGTH PROPERTIES WHICH OFFER GREAT POTENTIAL FOR WEIGHT REDUCTION. MAGNESIUM'S LOWER DENSITY MEANS MORE PARTS PER POUND OF METAL PURCHASED. MAGNESIUM ALLOYS ARE THE EASIEST OF ALL STRUCTURAL METALS TO MACHINE. IN THE MOL-TEN STATE, MAGNESIUM ALLOYS HAVE A VERY LOW SOLUBILITY FOR IRON AND THUS CAN BE PROCESSED IN UNLINED STEEL EQUIPMENT WITHOUT FEAR OF THE EQUIPMENT BEING AT-TACKED OR THE ALLOY BEING CONTAMINATED WITH IRON. THE LOW HEAT CONTENT PER UNIT

IT TO ITS CASTING TEMPERATURE THAN IS REQUIRED FOR AN EQUIVALENT VOLUME OF ALU-MINUM. UPON SOLIDIFICATION, THE LOWER HEAT RELEASE ALSO MEANS LESS THERMAL SHOCK TO EQUIPMENT AND TOOLING, A FACTOR WHICH ADDS SIGNIFICANTLY TO THE LIFE OF A MAGNESIUM CASTING DIE. MAGNESIUM DIE CASTING ALLOYS ARE RELATIVELY INSENSITIVE TO CHANGES IN COMPOSITION DURING PROCESSING, AND RU-NAROUND SCRAP CAN THUS BE REMELTED WITHOUT FEAR THAT A COMPOSITIONAL CHANGE WILL RESULT IN CASTINGS WHICH DO NOT MEET ALLOY SPECIFICATIONS. THE DIMENSIONAL STA-BILITY OF MAGNESIUM DIE CASTINGS IS OUTSTAND-ING. NEW DEVELOPMENTS IN THE AREAS OF FLUXLESS MELTING AND HOT CHAMBER DIE CAST-ING HAVE BROUGHT SIGNIFICANT COST REDUC-TIONS TO THE PROCESSING OF MAGNESIUM AND HAVE MADE THEM COMPETITIVE WITH DIE CASTINGS OF OTHER MATERIALS. WITH THEIR PROVEN RECORD OF SERVICEABILITY IN AUTOMO-TIVE APPLICATIONS, AND WITH AN EXCELLENT SUPPLY OF ALLOY FOR NEW APPLICATIONS, MAG-NESIUM DIE CASTINGS OFFER THE AUTOMOTIVE ENGINEER AN OUTSTANDING MEANS TO MEET THE CHALLENGE OF VEHICLE WEIGHT REDUCTION.

by STEPHEN C. ERICKSON  
DOW CHEMICAL  
Rept. No. SAE-770323; 1977; 15P 5REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 425

### **BATTERY PLATE CONNECTION IN SLI BATTERIES**

THE EVOLUTION OF PLATE BURNING AND CELL IN-TERCONNECTION OF SLI AUTOMOTIVE BATTERIES IS TRACED FROM THE OLDER ANTIMONY/LEAD BAT-TERIES TO THE NEWER MAINTENANCE-FREE BATTE-RIES. THERE WERE MANY MORE CHANGES IN CON-TAINER MATERIALS AND COVER AND TOP LEAD CONFIGURATIONS IN SLI BATTERIES IN THE LAST 10 OR 12 YEARS THAN THERE WERE IN THE FIRST 40 YEARS OF AUTOMOTIVE BATTERY USAGE. THESE CHANGES IN CONFIGURATION AND DESIGN IN THE PLATE AND INTERCELL CONNECTION DID NOT IN-VOLVE DRASTIC ALLOY CHANGES. THE GRID AND STRAP ALLOYS WERE ANTIMONY/LEAD; AND ALTHOUGH THE ANTIMONY CONTENT DECREASED OVER THE YEARS, THERE WAS NO REAL PROBLEM INVOLVED EITHER ELECTROCHEMICALLY OR FROM A METALLURGICAL COMPATIBILITY VIEWPOINT. IN THE EARLY 1970'S, THE APPEARANCE OF THE MAIN-TENANCE-FREE BATTERY FOR SLI SERVICE EVOLVED A NEW SET OF CRITERIA FOR THE TOP LEAD ALLOY. THE GRIDS FOR THESE MAIN-TENANCE-FREE BATTERIES WERE OF A CALCI-UM/TIN/LEAD ALLOY AND ELECTROCHEMICALLY CLEAN AS FAR AS THE POSITIVE AND NEGATIVE AC-TIVE MATERIAL WAS CONCERNED. THIS RESULTED IN ALMOST NEGLIGIBLE WATER LOSS DURING OPEN

OVERVOLTAGE, ELECTRICAL RESISTANCE, CORROSION RESISTANCE, STRENGTH AND HARDNESS, RESISTANCE TO FATIGUE AND VIBRATION FAILURE, METALLURGICAL COMPATIBILITY WITH GRID ALLOY, WELDABILITY BY RESISTANCE WELDING, WELDABILITY BY TORCH, AND EASE OF FABRICATION. THESE CRITERIA CAN BE DEVIATED AND STILL PRODUCE A SERVICEABLE, RELIABLE PRODUCT. BY RETAINING THE TOP LEAD NORMALLY USED FOR ANTIMONY ALLOY BATTERIES, THE EQUIPMENT AND TECHNOLOGY FOR BATTERY ASSEMBLY REMAINED ESSENTIALLY THE SAME FOR BOTH TYPES OF BATTERIES AND GREATLY DECREASED THE ASSEMBLY PROBLEMS INVOLVED WITH A NEW PRODUCT. A NEW HEAT ACCELERATED CORROSION TEST FOR COMPONENT EVALUATION HAS BEEN DEVELOPED AND HAS PROVED TO BE VERY VALUABLE FOR GRID EVALUATION FOR CASTING SOUNDNESS, EFFECT OF CALCIUM CONTENT, AND GRID CONFIGURATION, IN ADDITION TO EVALUATION OF THE STRAP-GRID CORROSION PROBLEM.

by ADDISON M. HOWARD  
CHLORIDE INC., AUTOMOTIVE DIV.  
Rept. No. SAE-770325; 1977; 8P 7REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 426

#### **WATER LOSS OF MAINTENANCE FREE VS ANTIMONY--A COMPARATIVE STUDY [AUTOMOTIVE BATTERIES]**

WATER LOSS AND GASSING CHARACTERISTICS WERE EXPERIMENTALLY STUDIED FOR LEAD/CALCIUM MAINTENANCE-FREE BATTERIES, STANDARD ANTIMONIAL LEAD BATTERIES, AND LOW ANTIMONY BATTERIES. USING THE SAE J240A LIFE TEST, THE RATE OF WATER CONSUMPTION FOR THE LEAD-CALCIUM SYSTEM STARTED OUT AT AN INITIAL RATE OF APPROXIMATELY 5 OUNCES PER 1000 CYCLES FOR THE FIRST 2500 CYCLES, DECREASING GRADUALLY TO AN EQUILIBRIUM RATE OF WATER CONSUMPTION OF 2.5 OUNCES PER 1000 CYCLES UNTIL FAILURE. THE LOW-ANTIMONY BATTERIES, ON THE OTHER HAND, STARTED OUT AT A RATE OF 6 OUNCES PER 1000 CYCLES AND INCREASED WITH INCREASING J240A CYCLES TO APPROXIMATELY 14 TO 15 OUNCES OF ELECTROLYTE PER 1000 CYCLES AT 4500 CYCLES. THE STANDARD 4.5% ANTIMONY TYPE STARTED AT 11 OUNCES PER 1000 CYCLES INCREASING TO 18 OUNCES PER 1000 CYCLES AT 3500 CYCLES. THE EFFECT OF STATE OF CHARGE ON THE GASSING RATES OF THE VARIOUS BATTERY SYSTEMS WAS ACCOMPLISHED BY SETTING UP A TEST REGIME CONSISTING OF A 400 AMP DISCHARGE FOR 9 SECONDS FOLLOWED BY A CONSTANT VOLTAGE CHARGEBACK (14.4 VOLTS, 80° F) FOR A PERIOD OF ONE HOUR. ALL THREE

UM AT A VERY LOW RATE OF APPROXIMATELY .13 CC PER MINUTE, WHILE THE LOW-ANTIMONY SYSTEM CAME TO EQUILIBRIUM AT .61 CC PER MINUTE, AND THE STANDARD 4.5% ANTIMONY SYSTEM AT .76 CC PER MINUTE. TO FURTHER EXPLORE AN OBSERVED VERY GOOD CORRELATION BETWEEN THE LOWER EQUILIBRIUM FLOAT CURRENTS OF THE LEAD/CALCIUM SYSTEM AND THE LOWERED GASSING RATES, THE TEST WAS REPEATED AT 125° F. THE ANTIMONY SYSTEMS CAME TO EQUILIBRIUM AT A RATE CONSIDERABLY HIGHER THAN THE LEAD/CALCIUM SYSTEM. THE TEMPERATURE HAD A DRASTIC EFFECT ON THE EQUILIBRIUM FLOAT CURRENTS. THE LEAD/CALCIUM SYSTEM INCREASED FROM 22 TO 68 MILLIAMPS AT 125° F, THE LOW-ANTIMONY SYSTEM FROM 78 TO 285 MILLIAMPS, AND THE 4.5% ANTIMONY SYSTEM FROM 96 TO 408 MILLIAMPS. THE LEAD/CALCIUM SYSTEM NOT ONLY EXHIBITED ITS CHARACTERISTICALLY LOW EQUILIBRIUM FLOAT CURRENT LEVEL BUT ALSO EXHIBITED A MUCH LOWER INCREASE IN EQUILIBRIUM FLOAT CURRENT WITH INCREASES IN TEMPERATURE. THE GASSING STARTED ALMOST IMMEDIATELY WITH THE INITIAL RATES VERY SIMILAR FOR ALL THREE SYSTEMS. HOWEVER, AT APPROXIMATELY 10 MINUTES INTO THE CHARGE, THE LEAD/CALCIUM SYSTEM ESSENTIALLY ATTAINED A UNIFORM RATE OF GAS EVOLUTION OF 0.6 CC PER MINUTE. WITH THIS RATE HOLDING CONSTANT THROUGHOUT THE 60-MINUTE CHARGE DURATION, THE LOW-ANTIMONY SYSTEM HAD COME TO EQUILIBRIUM AT THIS POINT AT 3.5 CC'S PER MINUTE, THE STANDARD 4.5% ANTIMONY SYSTEM AT 4.26 CC'S PER MINUTE.

by D. D. HAKARINE  
GOULD INC., AUTOMOTIVE BATTERY DIV.  
Rept. No. SAE-770326; 1977; 8P 1REF  
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#### **THE CHRYSLER LONG LIFE BATTERY CONCEPT**

THE CHRYSLER LONG LIFE BATTERY CONCEPT COMBINES A MAJOR REVISION IN BATTERY DESIGN AND AN IMPROVED ELECTRICAL AND THERMAL ENVIRONMENT TO PRODUCE A SYSTEM WITH OUTSTANDING RELIABILITY. FIRST, THE BATTERY WAS REDESIGNED TO HAVE HEAVIER GRIDS, DENSER ACTIVE MATERIAL, AND WIDER PLATES FOR INCREASED CAPACITY AND LONGER LIFE, WITHOUT AN INCREASE IN CONTAINER SIZE. THE BATTERY IS RATED AT 500 AMPS AT 0° F. SECOND, RUBBER SEPARATORS, THE BEST MATERIAL KNOWN, PROVIDED ASSURANCE THAT SEPARATOR DETERIORATION WILL NOT OCCUR AND SHORTEN BATTERY LIFE. THE USE OF RUBBER SEPARATORS, WITH A HIGHER ELECTRICAL RESISTANCE, REQUIRED ADDITIONAL PLATE AREA TO PROVIDE NEEDED CRANKING PERFORMANCE; WITH THE INCREASED SUR-

MATERIAL EMPLOYED, IT WAS POSSIBLE TO REDUCE THE FULL CHARGE SPECIFIC GRAVITY FROM 1.275 TO 1.265, THEREBY REDUCING THE TENDENCY FOR GRID CORROSION, AND STILL MAINTAIN AN EXCELLENT RESERVE CAPACITY OF MORE THAN 140 MINUTES. AND, FOURTH, BY INCORPORATING THESE INTERNAL IMPROVEMENTS INTO AN INNOVATIVE CONTAINER OF HIGH IMPACT POLYPROPYLENE, THE FOLLOWING ADDITIONAL PERFORMANCE AND PROCESS IMPROVEMENTS WERE REALIZED: SHORTEST POSSIBLE INTERCELL CONNECTORS FOR INCREASED VOLTAGE, INCREASED INTERNAL VOLUME WITHOUT WEIGHT AND SIZE INCREASES, BOTTOM SUPPORT FOR THE ELEMENTS REDUCING VIBRATION DAMAGE, IN-PROCESS QUALITY EVALUATION PROVIDING INCREASED RELIABILITY, PROTECTION FROM SEPARATOR DAMAGE BY THE TIP OF A HYDROMETER, AND ADDED IMPACT PROTECTION PROVIDED BY THE POLYPROPYLENE CONTAINER. TO OBTAIN RESULTS TO EVALUATE THE 5-YEAR OR 50,000 MILE SERVICE GOAL, ACCELERATED LABORATORY AND FIELD TESTS WERE EMPLOYED; THE PROGRAM GOAL TO PRODUCE A SYSTEM WHICH INCORPORATES A PREMIUM BATTERY AND CONTROL OVER ITS THERMAL AND ELECTRICAL ENVIRONMENT WAS MET AND FIELD RESULTS CONTINUE TO SUPPORT THE DECISION TO CREATE THE LONG LIFE BATTERY CONCEPT.

by C. J. VANHALTEREN  
CHRYSLER CORP.

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ENGINEERING CONGRESS AND EXPOSITION,  
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Availability: SAE

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## **NEW RATING STANDARDS FOR AUTOMOTIVE BATTERIES [SAE]**

NEW STANDARDS FOR RATING AUTOMOTIVE BATTERIES CLOSELY SIMULATE ACTUAL OPERATING CONDITIONS IN TODAY'S CARS; THEIR ADOPTION WILL ALLOW THE BATTERY SUPPLIERS INCREASED DESIGN FLEXIBILITY. THE RESERVE CAPACITY RATING REPLACES THE 20-HOUR DISCHARGE RATING. THE 20-HOUR DISCHARGE TEST MEASURED THE ABILITY OF BATTERIES TO SUSTAIN CAR PARKING LIGHT LOADS OVERNIGHT; AT THE TIME THIS RATING WAS ADOPTED, MOST STATES REQUIRED THAT CARS PARKED ON THE STREET OVERNIGHT MUST HAVE THE PARKING LIGHTS ON. THE RESERVE CAPACITY TEST MEASURES THE ABILITY OF THE BATTERY TO SUSTAIN A SELECTED MINIMUM VEHICLE ELECTRICAL LOAD IN THE EVENT OF A CHARGING SYSTEM FAILURE. THE COLD CRANKING TEST (30-SECOND TEST) MEASURES THE MAXIMUM DISCHARGE RATE IN AMPERES THAT A BATTERY AT THE RATING TEMPERATURES (0° F (-17.8° C) OR -20° F (-28.9° C)) CAN DELIVER FOR 30 SECONDS WHILE SUSTAINING A MINIMUM VOLTAGE OF 1.2 VOLTS PER CELL. THE SAE LIFE CYCLING TEST WAS

NEW STANDARDS WOULD ELIMINATE THE NECESSITY TO DESIGN BATTERIES TO MEET OBSOLETE REQUIREMENTS. THE NEW RATINGS WILL STOP THE USE OF THOSE DESIGNS, MATERIALS, AND PROCESSES WHICH GAVE EXCELLENT PERFORMANCE ON THE OBSOLETE TEST PROCEDURES, BUT WERE OF NO ADVANTAGE IN ACTUAL CAR SERVICE. IN VIEW OF THE FACT THAT BATTERY REQUIREMENTS IN THE AUTOMOTIVE VEHICLE ELECTRICAL SYSTEM WILL CONTINUE TO CHANGE, IT IS RECOMMENDED THAT ACTION SHOULD BE TAKEN TO REVIEW AND UPDATE THE STANDARDS EACH YEAR.

by ROGER L. BENNETT  
FORD MOTOR CO., ELECTRICAL AND ELECTRONICS DIV.  
Rept. No. SAE-770328; 1977; 11P 3REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 429

## **CRITICAL REVIEW OF THE STATE-OF-THE-ART IN THE TIRE FORCE AND MOMENT MEASUREMENTS**

THE STATE OF THE ART OF MEASUREMENTS OF TIRE FORCE AND MOMENT PROPERTIES IN STEADY-STATE AND TRANSIENT CONDITIONS IS REVIEWED, AND CERTAIN CONTROVERSIAL FACTORS INFLUENCING THESE PROPERTIES ARE ANALYZED. TESTING AT UNREALISTICALLY LOW SPEEDS AFFECTS TIRE FORCE AND MOMENT MEASUREMENT AT LEAST AS MUCH AS DRUM CURVATURE. TIRE MEASUREMENTS ARE ALSO SIGNIFICANTLY INFLUENCED BY CHARACTERISTICS OF THE TEST EQUIPMENT. FORCES AND MOMENTS ACTING ON THE TIRE CHANGE TIRE ELASTIC PROPERTIES; HOWEVER, THESE PROPERTIES RESTORE THEMSELVES AFTER THE TIRE "RESTS." VEHICLE RESPONSES IN TRANSIENT STEER MANEUVERS ARE STRONGLY INFLUENCED BY TRANSIENT TIRE PROPERTIES. BY USING A TRANSIENT TIRE MODEL IN SIMULATION OF VEHICLE TRANSIENT RESPONSES, THE SIDESLIP RESPONSE TIME HAS BEEN SHOWN TO INCREASE BY 32% OVER ITS VALUE DETERMINED BY USING A STEADY-STATE TIRE MODEL. IN THE LOW FREQUENCY RANGE PREVAILING DURING RAPID STEERING MANEUVERS, TRANSIENT TIRE PROPERTIES ARE CHARACTERIZED BY A DYNAMIC LATERAL FORCE OFFSET. THE DYNAMIC OFFSET CAN REACH UP TO 30% OF THE MAXIMUM VALUE OF THE LATERAL FORCE.

by WALTER BERGMAN  
FORD MOTOR CO.  
Rept. No. SAE-770331; 1977; 16P 29REFS  
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HS-023 430

**GENERATION OF CAMBER FORCES [BIAS TIRES]**

THE BIAS TIRE IS MODELED AS AN ELASTICALLY SUPPORTED RING IN ORDER TO STUDY ITS LATERAL DEFLECTION CHARACTERISTICS. THE TENSILE STRESSES INDUCED IN THE CARCASS OF A BIAS TIRE DUE TO INFLATION PRESSURE ARE TOO LOW TO ACCOUNT FOR OBSERVED RELAXATION LENGTHS. STUDIES OF BIAS-PLY LAMINATES SHOW THAT THEY HAVE A HIGH SHEAR MODULUS FOR CORD ANGLES NEAR 45°. THE CIRCUMFERENTIAL STIFFNESS OF BIAS-PLY SIDEWALLS IS SUFFICIENTLY GREAT TO ACCOUNT FOR THE SUBSTANTIAL LATERAL RIGIDITY OF BIAS TIRES. THE RELATIVELY HIGH CAMBER STIFFNESS OF BIAS TIRES CAN BE EXPLAINED BY CONSIDERING THE VARIATIONS IN ROLLING RADIUS THAT OCCUR ACROSS THE TREAD WIDTH WHEN THE TIRE IS INCLINED. VARIATIONS IN ROLLING RADIUS ARE MUCH SMALLER FOR THE RADIAL TIRE BECAUSE OF THE NEARLY INEXTENSIBLE BELT.

by F. J. WINSOR  
CHRYSLER CORP.  
Rept. No. SAE-770332; 1977; 15P 46REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 431

**THE EFFECT OF A TIRE'S REINFORCING MATERIAL ON ROLLING RESISTANCE**

A STUDY WAS UNDERTAKEN TO DETERMINE THE EFFECT OF THE TIRE'S FABRIC-REINFORCING SYSTEM, BOTH BELT AND CARCASS, ON ROLLING RESISTANCE AND FUEL CONSUMPTION. TESTING CONSISTED OF A ROLLING RESISTANCE WHEEL TEST, AND A ROAD TEST MEASURING FUEL CONSUMPTION. THE COASTDOWN PROCEDURE WAS UTILIZED. IT WAS FOUND THAT NEITHER CARCASS REINFORCEMENT NOR BELT REINFORCEMENT HAS A SIGNIFICANT EFFECT ON ROLLING RESISTANCE OR FUEL ECONOMY WITHIN THE RANGE OF FABRIC-REINFORCING MATERIALS CURRENTLY AVAILABLE ON A DIRECT SUBSTITUTION BASIS. THE LARGEST CHANGE IN ROLLING RESISTANCE PROPERTIES WOULD BE NO MORE THAN 1% TO 5%. AN INCREASE IN FUEL CONSUMPTION OF THIS AMOUNT MAY BE FOUND BY USING A HIGH-TENACITY, LOW SPECIFIC GRAVITY (LIGHTWEIGHT) CORD IN A SINGLE-PLY CARCASS WITH A HIGH-TENACITY STIFF BELT MATERIAL. TO INCREASE ROLLING RESISTANCE PROPERTIES SIGNIFICANTLY, A CHANGE IN TIRE DESIGN OR COMPOUNDING OR BOTH WILL BE NECESSARY.

by P. D. SHEPHERD  
GOODYEAR TIRE AND RUBBER CO.  
Rept. No. SAE-770333; 1977; 16P 3REFS  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 432

**DRINKING AND DRIVING [LEGISLATION; BRITAIN]**

BRITAIN'S ROAD SAFETY ACT 1967 IS EXAMINED IN TERMS OF ITS IMPACT ON THE DRINKING/DRIVING PROBLEM; AND RECOMMENDATIONS ARE PROPOSED FOR CHANGES IN THE PRESENT LAW, ROAD TRAFFIC ACT 1972, AS RELATED TO DRINKING AND DRIVING. ALCOHOL ACCOUNTS FOR AT LEAST ONE IN TEN OF ALL DEATHS AND INJURIES ON THE ROADS IN GREAT BRITAIN, AND ITS SHARE IS GROWING. THE SUCCESS OF THE ROAD SAFETY ACT 1967 SHARPLY, BUT ONLY TEMPORARILY, ARRESTED THIS NEGATIVE TREND. THE PROPORTION OF DRIVERS KILLED IN ACCIDENTS WHO HAVE A BLOOD ALCOHOL CONCENTRATION (BAC) ABOVE THE LEGAL LIMIT (80 MG/100 ML) IS HIGHER THAN IT HAS EVER BEEN, AND THE SOCIAL COST OF ROAD ACCIDENTS INVOLVING ALCOHOL NOW EXCEEDS 100 MILLION POUNDS A YEAR. ALTHOUGH NUMBERS OF BREATH TESTS AND CONVICTIONS HAVE RISEN, THE POLICE AND THE COURTS WORK UNDER HANDICAPS AND CANNOT STEM THE TIDE. THE MAIN RECOMMENDATIONS FOR CHANGES IN THE PRESENT LAW INCLUDE THE FOLLOWING: THAT, AS AT PRESENT, THERE SHOULD BE AN OFFENSE DEFINED IN TERMS OF BLOOD ALCOHOL LIMIT OF 80 MG/100 ML; THAT A BREATH SAMPLE SHOULD NORMALLY BE USED TO DETERMINE A DRIVER'S BAC, AS WELL AS FOR ROADSIDE SCREENING TESTS, BUT WITH A FALLBACK OPTION OF PROVIDING BLOOD IF THE BREATH ANALYSIS IS OVER THE LIMIT; THAT A CONSTABLE AT PERSONAL DISCRETION SHOULD HAVE POWER TO REQUIRE A BREATH TEST OF A PERSON WHO IS OR HAS BEEN DRIVING OR ATTEMPTING TO DRIVE OR IN CHARGE OF A MOTOR VEHICLE; THAT PROOF OF AN OFFENSE SHOULD NOT BE UNREASONABLY DEPENDENT ON COMPLIANCE WITH PROCEDURAL REQUIREMENTS; THAT AN ORDER OF DISQUALIFICATION FOR A YEAR (OR LONGER AT THE COURT'S DISCRETION) SHOULD CONTINUE TO BE THE MAIN PENALTY, IN CONJUNCTION WITH FINES, BUT THAT IN "HIGH-RISK" CASES (I.E. THOSE WITH VERY HIGH BAC'S, AND REPEAT OFFENDERS), LICENSES SHOULD NOT BE RESTORED UNTIL THE COURT IS SATISFIED THAT THE OFFENDER DOES NOT PRESENT UNDUE RISKS AS A DRIVER; AND THAT THERE SHOULD BE A CONTINUING PROGRAM OF PUBLICITY, HAVING PARTICULAR REGARD TO THE EDUCATION OF YOUNG DRIVERS, TO DEVELOP INFORMED AND RESPONSIBLE ATTITUDES TO DRINKING AND TO ENLIST SUPPORT FOR THE LAW.

DEPARTMENT OF THE ENVIRONMENT,  
DEPARTMENTAL COM. ON DRINKING AND DRIVING,  
LONDON, ENGLAND  
1976; 88P  
Availability: PENDRAGON HOUSE, INC., 2595 E.  
BAYSHORE RD., PALO ALTO, CALIF. 94303

December 31, 1978

HS-023 433

### **CAR CRASHES: PERCEIVED VULNERABILITY AND WILLINGNESS TO PAY FOR CRASH PROTECTION**

A JUL 1976 SURVEY OF A NATIONAL RANDOM SAMPLE OF 1017 PERSONS WHO INTENDED TO PURCHASE NEW CARS WITHIN THE NEXT THREE YEARS WAS UNDERTAKEN TO DETERMINE ATTITUDES ABOUT OCCUPANT CRASH PROTECTION. IN RESPONSE TO QUESTIONS ABOUT INCREASED PROTECTION FROM CRASHES IN THEIR NEW CARS, ONLY 15% OF THE RESPONDENTS CHOSE EXCLUSIVELY "PROTECTION THAT YOU AND YOUR PASSENGERS MUST ACTIVATE EVERY TIME YOU TRAVEL," COMPARED WITH 39% WHO CHOSE EXCLUSIVELY "PROTECTION SO THAT YOU AND YOUR PASSENGERS DO NOT HAVE TO DO ANYTHING," AND 38% CHOSE "BOTH TYPES OF PROTECTION." THE REMAINING 8% HAD NO OPINION. RESPONDENTS WERE WILLING TO ADD AN AVERAGE OF \$12 TO THEIR MONTHLY CAR PAYMENTS, IF THE ADDED COST WOULD SAVE 6000 LIVES A YEAR (THREE TIMES THE AMOUNT THAT THE CURRENTLY AVAILABLE TECHNOLOGY WOULD ACTUALLY COST TO SAVE 8800 LIVES PER YEAR). TO SAVE 12,000 AND 18,000 LIVES A YEAR, THE AMOUNTS AVERAGED \$16.69 A MONTH AND \$19.92 A MONTH, RESPECTIVELY. WHEN ASKED WHETHER THEY FAVORED OR OPPOSED A STATE LAW REQUIRING PEOPLE TO USE SEAT BELTS IN MOTOR VEHICLES EVERY TIME THEY TRAVELED, 47% OF THE RESPONDENTS FAVORED THE LAW, 50% OPPOSED IT, AND 3% HAD NO OPINION. PERCEIVED VULNERABILITY WAS MEASURED BY ASKING WHETHER THE RESPONDENT THOUGHT HIS/HER "CHANCES OF BEING KILLED OR INJURED IN A CAR CRASH" WERE GREATER THAN, THE SAME AS, OR LESS THAN "PEOPLE LIKE YOURSELF." ONLY 6% CHOSE "GREATER THAN," COMPARED WITH 40% WHO CHOSE "LESS THAN," AND 45% WHO CHOSE "THE SAME." THE REMAINDER HAD NO OPINION. NO STATISTICALLY SIGNIFICANT ASSOCIATIONS WERE FOUND BETWEEN PERCEIVED VULNERABILITY AND BUYER PREFERENCES FOR CRASH PROTECTION AND BUYER WILLINGNESS TO PAY FOR INCREASED PROTECTION. MOREOVER, NO STATISTICALLY SIGNIFICANT DIFFERENCES WERE FOUND IN BUYER PREFERENCES FOR THE TYPES OF CRASH PROTECTION, THE AMOUNTS THEY WERE WILLING TO SPEND FOR INCREASED PROTECTION, OR THEIR OPINIONS ON BELT-USE LAWS WHEN COMPARISONS WERE MADE BETWEEN MEN AND WOMEN, RELATED TO THE TIME OF THE INTENDED PURCHASE, BETWEEN THE REGIONS OF THE COUNTRY, OR BETWEEN MEMBERS AND NONMEMBERS IN THE AMERICAN AUTOMOBILE ASSOCIATION (AAA) OR OTHER AUTOMOBILE CLUBS.

by LEON S. ROBERTSON

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1977; 12REFS

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HS-023 434

### **MICHIGAN FATAL ACCIDENTS INVOLVING ALCOHOL, 1968-1976**

IN A QUESTION-AND-ANSWER FORMAT, DR. JAIRUS D. FLORA DESCRIBES THE METHODS AND FINDINGS OF A RESEARCH PROJECT ON MICHIGAN FATAL TRAFFIC ACCIDENTS INVOLVING ALCOHOL DURING THE PERIOD 1968-1976. THERE WERE 16,860 FATAL ACCIDENTS INVOLVING CLOSE TO 20,000 FATALITIES. THE EFFECT OF THE ENERGY CRISIS IN 1974 AND 1975, WHEN PEOPLE DID LESS DRIVING AND PROBABLY SLOWER DRIVING, IS REFLECTED IN THE LOWEST NUMBER OF ANNUAL FATAL ACCIDENTS IN THOSE TWO YEARS COMPARED TO THE OTHER YEARS OF THE STUDY. THE PERCENTAGES OF FATAL-ACCIDENT-INVOLVED DRIVERS REPORTED AS "HAD BEEN DRINKING," FOR ALL AGES, ARE AS FOLLOWS: 30.3% (1968), 30.7% (1969), 29.4% (1970), 28.1% (1971), 28.9% (1972), 31.0% (1973), 34.7% (1974), 36.9% (1975), AND 36.1% (1976). THE AMOUNT OF MISSING DATA ON POLICE REPORTING FORMS (I.E. CASES IN WHICH NO STATEMENT WAS MADE ON FORMS ABOUT THE PRESENCE/ABSENCE OF ALCOHOL) WAS REDUCED AFTER THE NUMBER OF ENTRY OPTIONS RELATING TO ALCOHOL INVOLVEMENT WAS CHANGED FROM FIVE TO TWO (HAD BEEN DRINKING, OR HAD NOT BEEN DRINKING) IN 1971. SINCE THE MINIMUM LEGAL DRINKING AGE WAS LOWERED (FROM 21 TO 18) IN 1972, THE PERCENTAGE OF FATAL ACCIDENTS IN WHICH A DRIVER AGED 18 TO 20 "HAD BEEN DRINKING" HAS AVERAGED 41.3%. FOR THE FOUR YEARS BEFORE THE CHANGE IN THE LAW, THAT AVERAGE WAS 26.9%. THE RATE OF "HAD BEEN DRINKING" FOR DRIVERS AGED 15 TO 17 INCREASED BY 50%; THE RATE FOR DRIVERS AGED 21 TO 23 WHO WERE INVOLVED IN FATAL ACCIDENTS WAS NOT SIGNIFICANTLY HIGHER AFTER 1972 THAN IT WAS BEFORE 1972. IF THE LAW HAD NOT CHANGED, THERE WOULD PROBABLY HAVE BEEN SOME INCREASE IN THE RATES FOR DRIVERS OF ALL AGES, PARTICULARLY IN 1974 BECAUSE OF THE INTRODUCTION OF THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION'S (NHTSA) FATAL ACCIDENT REPORTING SYSTEM (FARS) WHICH PUTS GREAT EMPHASIS ON COMPLETE DATA. IN ADDITION TO AN INCREASE IN THE RATES OF INVOLVEMENT OF "HAD BEEN DRINKING" YOUNG DRIVERS (18-20 AGE GROUP) IN FATAL ACCIDENTS, THE ACTUAL NUMBERS INVOLVED INCREASED AFTER THE LEGAL DRINKING AGE WAS LOWERED. ONLY ABOUT 4% OF THE DRIVERS INVOLVED IN FATAL ACCIDENTS AFTER DRINKING WERE FEMALE. IT IS DIFFICULT TO SAY HOW MUCH EFFECT THE CHANGE IN THE LAW RAISING THE LEGAL DRINKING AGE FROM 18 TO 19, EFFECTIVE 3 DEC 1978, WILL HAVE; THE QUESTION OF HOW WELL THE NEW LAW IS ENFORCED IS AN IMPORTANT ONE.

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1978; 15P 1REF

Availability: SEE PUBLICATION

HS-023 435

### STUDDED TIRES AND HIGHWAY SAFETY. AN ACCIDENT ANALYSIS

TO MEASURE THE EFFECT OF BANNING STUDDED TIRES, WINTER ACCIDENT AND DRIVER EXPOSURE DATA WERE COLLECTED IN BOTH MINNESOTA AND MICHIGAN. THE MINNESOTA ANALYSES INVOLVED A COMPARISON OF DATA BEFORE AND AFTER STUDDED TIRES WERE BANNED IN THE STATE. THE MICHIGAN RESULTS WERE OBTAINED BY REPLACING ACCIDENT RATE AND INJURY MEASURES FOR AUTOS WITH STUDDED TIRES BY THOSE FOR CARS WITH SNOW TIRES; IN THIS WAY, PREDICTIONS OF THE EFFECTS OF BANNING STUDS WERE MADE. FOR MINNESOTA, THE BEFORE-TO-AFTER CHANGE IN THREE MEASURES OF RISK WAS DETERMINED FOR DRIVERS USING STUDDED TIRES IN THE BEFORE PERIOD AND SNOW TIRES IN THE AFTER PERIOD, AND FOR DRIVERS USING SNOW TIRES IN BOTH PERIODS. THE SNOW-TIRE GROUP WAS THE CONTROL GROUP AGAINST WHICH THE EFFECTS OF CHANGING FROM STUDDED TIRES TO SNOW TIRES WERE COMPARED. WHEREAS THE MINNESOTA RESULTS REFLECT BEFORE-TO-AFTER CHANGES IN PERCENTAGE TERMS, THE MICHIGAN FINDINGS SHOW RISK AS MEASURED IN TERMS OF RATES. HERE, THREE MEASURES OF RISK WERE EMPLOYED TO COMPARE AUTOS WITH STUDDED TIRES VS. THOSE WITH SNOW TIRES. THE MICHIGAN FINDINGS INCLUDE COMPARISONS OF TIRE TYPES WITH, AND WITHOUT, THE INFLUENCE OF DRIVER CAUTION ASSOCIATED WITH SLIPPERY ROADS. THE RESULTS OF STUDIES PERFORMED SEPARATING URBAN AND RURAL AREAS SHOW THAT, WHEN CONSIDERING INJURY AND THE DIRECT EFFECTS OF REDUCED FRICTION ON THE LIKELIHOOD OF ACCIDENT INVOLVEMENT, STUDDED TIRES WERE MORE EFFECTIVE IN URBAN, OR LOWER SPEED, AREAS. WHEN CONSIDERING THE COMBINED EFFECT ON ACCIDENT RATES OF BOTH REDUCED FRICTION AND THE ASSOCIATED DRIVER CAUTION, THE ADVANTAGE OF STUDDED TIRES WAS REVERSED IN URBAN AREAS, BUT FURTHER ENHANCED IN RURAL AREAS. STUDIES OF THE EFFECTS OF SLIPPERY ROAD SURFACES RELATIVE TO CLEAR SURFACES, REGARDLESS OF TIRE TYPE, INDICATE THAT THE PROPORTION OF ACCIDENTS RESULTING IN INJURY WAS LOWER ON SLIPPERY ROADS. ON THE OTHER HAND, THE INCREASED LIKELIHOOD OF HAVING AN ACCIDENT ASSOCIATED WITH SLIPPERY ROADS RANGED FROM 34% TO ALMOST 100%, DEPENDING ON THE BREADTH OF THE MEASURE EMPLOYED. OBVIOUSLY, THE SLIPPERY ROAD PROBLEM WAS SEVERE. THUS, STUDDED TIRES SHOULD NOT BE VIEWED AS A UNIQUE REMEDIAL APPROACH; RATHER, THERE REMAINS A SERIOUS SAFETY PROBLEM REQUIRING A MULTIFACETED SEARCH FOR SOLUTION.

by KENNETH PERCHONOK  
CALSPAN CORP., DATA ANALYSIS SECTION,  
BUFFALO, N.Y.

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Availability: TRB \$4.80

HS-023 436

### INFLUENCE OF VEHICLE DESIGN ON PEDESTRIAN LEG INJURIES

DATA FROM TWO DIFFERENT TYPES OF PEDESTRIAN ACCIDENT STUDIES WERE USED TO EXAMINE THE INFLUENCE OF VEHICLE FRONT END DESIGN ON PEDESTRIAN PELVIC AND LEG INJURIES. FIRST, DATA FROM A STUDY USING EXISTING HOSPITAL AND POLICE RECORDS WERE USED TO DESCRIBE THE GENERAL PATTERN OF INJURY SUSTAINED BY 1560 PEDESTRIANS WHO WERE STRUCK BY THE FRONTS OF CARS OR LIGHT-DUTY TRUCKS, THE FRONTS OF WHICH WERE BASED ON CAR DESIGNS. SECOND, DATA FROM IN-DEPTH STUDIES OF PEDESTRIAN ACCIDENTS WERE USED TO EXAMINE IN MORE DETAIL THE EFFECTS OF IMPACT SPEED, BUMPER HEIGHT AND BUMPER LEAD, AND HOOD HEIGHT ON PEDESTRIAN PELVIC AND LEG INJURIES. RESULTS OF THE TWO STUDIES SHOW THAT THE DESIGN OF THE VEHICLE FRONT STRUCTURE CAN INFLUENCE THE LOCATION AND SEVERITY OF THE PELVIC AND LEG INJURIES SUSTAINED BY PEDESTRIANS. LOW-MOUNTED BUMPERS WITH SHORT LEADS APPEARED TO BE LEAST LIKELY TO CAUSE FRACTURE, ALTHOUGH SHORT BUMPER LEAD IS ASSOCIATED WITH A HIGHER INCIDENCE OF PELVIC FRACTURES--HOWEVER, IT IS ALSO ASSOCIATED WITH A LOWER OVERALL INCIDENCE OF BOTH PELVIC AND LEG FRACTURE. THE OPTIMAL DESIGN IS THUS A COMPROMISE BETWEEN DIFFERENT CONFLICTING REQUIREMENTS. THE VEHICLE FRONT STRUCTURE SHOULD BE A SMOOTH STRUCTURE APPLYING A DISTRIBUTED LOADING TO THE PEDESTRIAN'S LOWER LIMBS RATHER THAN HAVE A SEPARATE BUMPER AND LEADING EDGE WHICH APPLY TWO CONCENTRATED LOADS. COMPLIANCE IS LIKELY TO HAVE MORE EFFECT ON INJURIES THAN SHAPE. A REDUCTION OF 20% TO 25% OF NONMINOR, NONFATAL INJURIES TO PEDESTRIANS BEING STRUCK BY LIGHT VEHICLE FRONTS COULD BE EXPECTED WITH SUCH IMPROVEMENTS.

by S. J. ASHTON; J. B. PEDDER; G. M. MACKAY  
UNIVERSITY OF BIRMINGHAM, ACCIDENT RES.  
UNIT., BIRMINGHAM, ENGLAND  
1978; 20P 18REFS  
SPONSORED BY INSURANCE INST. FOR HWY.  
SAFETY, AND TRANSPORT AND ROAD RES. LAB.  
Availability: INSURANCE INST. FOR HWY. SAFETY,  
WATERGATE 600, SUITE 300, WASHINGTON, D.C. 20037

HS-023 437

### THE NEW TUNEUP

INFORMATION FOR THE AUTO MECHANIC ON CHECKING VEHICLE COMPRESSION, IGNITION, AND CARBURETION IS GIVEN. TESTS AND ADJUSTMENTS DESCRIBED INCLUDE THE FOLLOWING: VACUUM DURING CRANKING; COMPRESSION; POINT DWELL; TIMING; CYLINDER POWER BALANCE; PCV (POSITIVE CRANKCASE VENTILATION) VALVE BLOCK; CARBURETOR, INCLUDING MEASUREMENTS OF CARBON MONOXIDE AND HYDROCARBONS; ACCELERATOR PUMP PERFORMANCE; AND POWER VALVE. TODAY THE TUNE-UP OF THE CAR'S ENGINE CAN NO

LONGER BE PERFORMED BY SIMPLY USING A TACH-DWELL AND TIMING LIGHT; THERE ARE TOO MANY VARIABLES THAT HAVE TO BE SYNCHRONIZED TO MEET MANUFACTURER'S SPECIFICATIONS. TO FINE TUNE TODAY'S ENGINE, ALL ENGINE OPERATING SYSTEMS MUST BE CHECKED WITH ELECTRONIC TESTING EQUIPMENT TO BE SURE THE SPARK ADVANCE AND AIR/FUEL MIXTURE ARE AS SPECIFIED BY THE MANUFACTURER SO THAT EACH CYLINDER GETS THE PROPER AMOUNT OF FUEL AND IS IGNITED AT PRECISELY THE RIGHT TIME TO ASSURE MAXIMUM PERFORMANCE AND FUEL ECONOMY.

by JOHN SAMANICH

Publ: MOTOR V149 N4 P61-3, 76, 78, 80 (APR 1978)  
1978

Availability: SEE PUBLICATION

HS-023 438

### **CARBURETION SERIES: TROUBLESHOOTING CARB PROBLEMS**

FIRST, IT IS NECESSARY THAT THE CARBURETOR BE PROPERLY IDENTIFIED BY MODEL AND LIST (PART) NUMBER BEFORE PARTS OR KITS ARE PURCHASED OR SERVICE IS STARTED. ONCE THE PART NUMBER HAS BEEN FOUND ON THE CARBURETOR, THE APPROPRIATE MANUFACTURER'S PARTS AND SPECS MANUAL SHOULD BE CONSULTED TO FIND THE PARTS AND SPECIFICATIONS NEEDED. (AN EXAMPLE OF INFORMATION FOUND IN THE HOLLEY PARTS AND SPECS MANUAL FOR A SPECIFIC ENGINE, AND CARBURETOR MODEL AND PART IS CITED.) BEFORE ATTEMPTING TO REPAIR A CARBURETOR MALFUNCTION, IT IS NECESSARY TO DETERMINE WHICH MODE THE ENGINE IS IN WHEN THE PROBLEM OCCURS; THIS WILL TELL WHICH METERING SYSTEM IS SUSPECT. ONCE THE METERING SYSTEM THAT HAS A PROBLEM IS PINPOINTED, NECESSARY REPAIRS OR REPLACEMENT CAN BE MADE. INFORMATION ON CHECKING OUT THE FOUR BASIC METERING SYSTEMS (IDLE SYSTEM, MAIN METERING SYSTEM, ACCELERATOR PUMP SYSTEM, AND POWER ENRICHMENT SYSTEM), AS WELL AS THE FUEL INLET OR FLOAT SYSTEM AND THE CHOKE SYSTEM, IS OUTLINED.

by JOHN SAMANICH

Publ: MOTOR V149 N4 P47-9 (APR 1978)  
1978

Availability: SEE PUBLICATION

HS-023 439

### **WHERE THE RUBBER MEETS THE ROAD [NEW TIRE DESIGNS]**

IN ADDITION TO SIMPLY REDUCING WEIGHT IN THE NEW TIRES, THE TIRE DESIGN ENGINEERS HAVE RECENTLY MADE SEVERAL MAJOR BREAKTHROUGHS IN THE AREAS OF PROFILE SHAPES, INFLATION PRESSURES, AND TREAD DESIGNS. FIRESTONE, FOR EXAMPLE, HAS BEEN EXTREMELY ACTIVE IN SEVERAL OF THESE AREAS, ESPECIALLY HIGHER INFLATION PRESSURES. ITS NEW METRIC RADIALS (E.G. 721, S/S RADIAL, AND

SUPREME) HAVE A MAXIMUM INFLATION LEVEL OF 35 PSI, COMPARED WITH 32 PSI FOR CONVENTIONAL RADIALS. MICHELIN IS ALSO MANUFACTURING RADIALS IN METRIC AND ALPHANUMERIC SIZES. IN ADDITION TO A FIRM ROAD GRIP AND LONG TREAD MILEAGE, THE XWW 70 SERIES FEATURES A NEW WIDE, SPORTY LOOK AND A LOW PROFILE, AND THE XM05 HAS A TREAD PATTERN THAT HAS PROVEN EFFECTIVE IN MEETING WINTER DRIVING CONDITIONS. A NEW CONCEPT IN TIRE DESIGN WAS DEMONSTRATED BY GOODYEAR A FEW MONTHS AGO, BASED ON A SPECIAL ELLIPTICAL CONFIGURATION. THE TIRE RUNS COMFORTABLY AT PRESSURES 8 TO 12 PSI GREATER THAN CONVENTIONAL RADIALS AND PROVIDES 4%-8% MORE MPG THAN PRESENT RADIALS, DEPENDING ON THE SPEED OF THE TEST. ONE OF THIS TIRE'S SPECIAL FEATURES IS AN ELLIPTICALLY SHAPED SIDEWALL THAT FORMS A CURVE RIGHT DOWN TO THE POINT WHERE THE TIRE MEETS THE WHEEL RIM. THIS CONTRIBUTES TO THE TIRE'S ABILITY TO FLEX AND ABSORB ROAD IRREGULARITIES WHILE PROVIDING GOOD CONTROL AND HANDLING, AS WELL AS A SMOOTH RIDE EVEN AT HIGHER INFLATION. VARIOUS CONCEPTS HAVE BEEN DEVELOPED TO REDUCE THE SIZE OF THE SPARE AND EVENTUALLY TO ELIMINATE IT. FOR EXAMPLE, FIRESTONE'S TEMPA SPARE WITH ITS SPECIAL WHEEL WEIGHS 25-30 LBS, COMPARED WITH 42-50 LBS FOR THE CONVENTIONAL SPARE IT IS REPLACING. THE TEMPA IS STORED FULLY INFLATED AND CAN BE MOUNTED WITH CONVENTIONAL WHEEL-CHANGING TOOLS. A SIMILAR SPARE IS UNIROYAL'S HIDEAWAY. ANOTHER DEVELOPMENT IS THE ALL-SEASON TIRE. GOODYEAR HAS NAMED THIS TIRE TIEMPO, AND IT IS DESIGNED FOR USE ON DRY PAVEMENT OR IN SNOW. ANOTHER ALL-WEATHER TIRE IS UNIROYAL'S STEEL-BELTED RADIAL ROYAL MASTER. B.F. GOODRICH RECENTLY DEVELOPED A TIRE CALLED THE ADVANTAGE WHICH IT CALLS AN ALL-SEASON TIRE, NOT AN ALL-WEATHER TIRE, EMPHASIZING THAT IT DOES NOT REPLACE A SNOW TIRE UNDER ALL CIRCUMSTANCES. A TRULY REVOLUTIONARY DEVELOPMENT ON WHICH SOME OF THE MAJOR TIRE PRODUCERS ARE WORKING AT PRESENT IS A SO-CALLED RUN FLAT TIRE, WHICH WILL ELIMINATE THE NEED FOR A SPARE TIRE AND A JACK, THEREBY NOT ONLY RELEASING THE TRUNK, BUT ALSO REDUCING THE OVERALL WEIGHT OF A CAR BY AN AVERAGE OF ABOUT 20 LB. FIRESTONE'S ADVANCED CONCEPT TIRE (ACT), STILL SEVERAL YEARS BEFORE ITS INTRODUCTION ON THE MARKET, CAN BE DRIVEN SMOOTHLY AND SAFELY UP TO 50 MILES TO A REPAIR POINT AFTER IT HAS GONE FLAT.

by LUCIEN L. GARVIN

Publ: MOTOR V149 N4 P42-6, 68 (APR 1978)  
1978

Availability: SEE PUBLICATION

HS-023 440

### **MOTORCYCLE DRIVE CHAIN CARE**

SOME TIPS ON PROPER MOTORCYCLE DRIVE CHAIN CARE ARE OUTLINED. REQUIRED TOOLS, CHECKING

SPROCKETS FOR DAMAGE AND WEAR, CHAIN REMOVAL, MEASURING CHAIN WEAR, LUBRICATING CHAINS, CLEANING CHAINS, ALIGNING WHEELS, DETERMINING PROPER CHAIN TENSIONS, AND ADJUSTING CHAINS ARE SEPARATELY CONSIDERED. STEP-BY-STEP INSTRUCTIONS ARE PROVIDED, SOME PROCEDURES ILLUSTRATED BY PHOTOGRAPHS. SOME MYTHS ABOUT CHAIN CLEANING (E.G. SOAKING THE CHAIN IN SOLVENT THOROUGHLY TO REMOVE DIRT AND OLD LUBRICANT) AND WHEEL ALIGNMENT (E.G. INDEX OR "HASH" MARK METHOD) ARE NOTED.

by LEE K. SHUSTER

Publ: DRIVER V11 N12 P24-8 (MAY 1978)

1978

THE BACKYARD MECHANIC.

Availability: SEE PUBLICATION

HS-023 441

### SOFT PEDALING [MOPED SAFETY]

A MOPED IS A CROSS BETWEEN A BICYCLE AND A MOTORCYCLE. THE REAR WHEEL OF A MOPED IS CHAIN-DRIVEN BY THE MOTOR, UNLIKE OTHER HYBRID, MOTORIZED BICYCLES WHICH ARE SIMPLY BICYCLES WITH A MOTOR ATTACHED TO THE FRAME AT THE FORK. ECONOMY (100-150 MPG) IS PROBABLY THE MOPED'S GREATEST SELLING POINT. THEY RANGE IN PRICE FROM \$300 TO \$500. THERE ARE SOME DEFINITE LIMITATIONS TO THE MOPED MODE OF TRANSPORTATION. FIRST, THEY ARE NOT AS LARGE NOR AS POWERFUL AS MOTORCYCLES; THEY HAVE A TOP SPEED OF AROUND 30 MPH. ALSO, THEY ARE NOT TRAIL BIKES; THEY ARE MADE ONLY FOR ON-ROAD OPERATION. THEY ARE DESIGNED TO GET ONE PERSON AND MINIMAL BAGGAGE FROM ONE SPOT TO ANOTHER. RIDING A MOPED REQUIRES THAT THE RIDER BE EXTRA CAREFUL. DRIVING AT INTERSECTIONS ON A MOPED IS THE MOST DANGEROUS SITUATION; THE MOTORCYCLE RIDER'S OLD COMPLAINT OF BEING "THE INVISIBLE MAN" IS EQUALLY APPLICABLE TO THE MOPED RIDER. A MOPED RIDER SHOULD MAKE HIMSELF/HERSELF AS VISIBLE AS POSSIBLE BY WEARING WHITE CLOTHING AT NIGHT AND BRIGHT-COLORED CLOTHING DURING THE DAY, BY USING REFLECTIVE TAPE, AND BY MAKING USE OF THE HEADLIGHT. IN VIEW OF THE LIMITED SPEED AND MANEUVERABILITY OF THE MOPED, IT IS NECESSARY TO DRIVE "SUPER DEFENSIVELY." SOME BASICS IN DRIVING A MOPED SAFELY INCLUDE THE FOLLOWING: DO NOT RIDE TWO ABREAST ON THE ROAD, DO NOT SWING IN AND OUT BETWEEN CARS IN TRAFFIC, BE VERY CAREFUL AT INTERSECTIONS, GIVE YOURSELF PLENTY OF ROOM IN CASE YOU ARE IN AN AUTO DRIVER'S BLIND SPOT, AND SLOW DOWN AT NIGHT. BEFORE USING A MOPED, ONE SHOULD BE VERY FAMILIAR WITH ITS CONTROLS AND PRACTICE RIDING IT BEFORE VENTURING INTO TRAFFIC. A MOPED WILL REQUIRE MORE MAINTENANCE THAN A BICYCLE. A FEW POINTERS ON PROPER OPERATION OF THE MOPED (E.G. POSITION OF PEDALS, TURNING, BRAKING, SIGNALING,

THINGS TO WATCH OUT FOR (E.G. ROUGH ROADS), AND WHAT TO WEAR) ARE OUTLINED.

Publ: DRIVER V11 N12 P18-22 (MAY 1978)

1978

Availability: SEE PUBLICATION

HS-023 442

### LIGHT SCATTERING BY PARTICULATE EMISSIONS FROM VEHICLES ON THE ROAD

AN EXPERIMENT WAS UNDERTAKEN TO OBTAIN A MORE REALISTIC PICTURE OF THE NEAR-ROADWAY VISIBILITY EFFECTS OF VEHICLE EMISSIONS BY MEASURING THE LIGHT SCATTERING AND MASS LOADING IN THE AIR INSIDE A VEHICLE TUNNEL AND, SIMULTANEOUSLY, IN THE AMBIENT AIR OUTSIDE. THE LIGHT SCATTERING AND MASS LOADING DUE TO VEHICLE AEROSOL ALONE ARE OBTAINED BY DIFFERENCE. IN THIS FASHION THE LIGHT SCATTERING POWER OF THE VEHICLE AEROSOL ON A PER UNIT MASS BASIS AND, FOR COMPARISON, THE LIGHT SCATTERING POWER OF THE AMBIENT AEROSOL ARE ASCERTAINED. MOREOVER, BY KEEPING TRACK OF TUNNEL WIND FLUX, TRAFFIC FLUX, AND TRAFFIC COMPOSITION (% DIESEL TRUCKS), THE LIGHT SCATTERING POWER IS PUT ON A PER VEHICLE MILE BASIS, CATEGORIZED AS TO VEHICLE TYPE. IT WAS DETERMINED THAT LIGHT SCATTERING BY VEHICLE AEROSOL DOES NOT SUBSTANTIALLY DEGRADE ATMOSPHERIC VISIBILITY ALONG THE ROADWAY. THIS CONDITION WAS OBVIOUS EVEN FROM THE RAW DATA, AS THE SCATTERING BY AEROSOL PARTICLES EVEN IN THE CONFINES OF THE TUNNEL WERE NOT TOO DIFFERENT FROM THAT SOMETIMES ENCOUNTERED IN THE RURAL AMBIENT AIR. IT REFLECTS THE FACT THAT THE SCATTERING OF THE FRESH VEHICLE AEROSOL IS DISPROPORTIONATELY SMALL RELATIVE TO THE MASS. HOWEVER, ONE MUST RESIST THE TEMPTATION TO EXTRAPOLATE THIS TO THE SITUATION AWAY FROM THE ROAD, AS THE PARTICLES, AND HENCE THEIR LIGHT SCATTERING POWER, WILL GROW. IN RESIDENCE CHAMBER EXPERIMENTS, FOR EXAMPLE, THE ASYMPTOTIC (AFTER APPROXIMATELY 2 HOURS) LIGHT SCATTERING POWER HAS BEEN FOUND TO APPROACH 3 TO 4 SQ M/G, COMPARABLE TO THAT OF A TYPICAL ATMOSPHERIC AEROSOL. IT WAS ALSO CONCLUDED FROM THIS STUDY THAT TO THE EXTENT THAT NEAR-ROAD LIGHT SCATTERING BY VEHICLE-EMITTED AEROSOL SHOULD BE SIGNIFICANT, IT WOULD CENTER MOSTLY ON THE DIESEL TRUCK (LIGHT SCATTERING POWER OF AEROSOL/UNIT MASS OF AEROSOL, 3.1 SQ M/G). EVEN A DIESEL AUTOMOBILE (PARTICULATE EMISSION RATE APPROXIMATELY 0.3 G/KM) SHOULD HAVE A LIGHT SCATTERING INTEGRAL GREATER THAN 10 TIMES THAT OF A CURRENT GASOLINE-POWERED CAR.

by WILLIAM R. PIERSON; DOUGLAS E. MCKEE

Publ: JOURNAL OF THE AIR POLLUTION CONTROL ASSOCIATION V28 N6 P604-7 (JUN 1978)

1978; 22REFS

Availability: SEE PUBLICATION

HS-023 443

# **AUGMENTED INGESTION OF CARBON MONOXIDE AND SULFUR OXIDES BY OCCUPANTS OF VEHICLES WHILE IDLING IN DRIVE-UP FACILITY LINES**

FOR A LINEUP OF AUTOMOBILES WAITING FOR A PERIOD OF TIME AT A DRIVE-UP FACILITY, THE IDLING ENGINE EMISSIONS ARE EXPELLED IN A REARWARD DIRECTION AND TEND TO ENVELOPE THE VEHICLES AT THE END PORTION OF THE QUEUE. FACTORS THAT AFFECT THESE HIGHLY LOCALIZED POLLUTANT ACCUMULATION EPISODES INCLUDE LOCAL METEOROLOGICAL CONDITIONS (E.G. LOW-ALTITUDE INVERSIONS, WINDS, AND TEMPERATURES); NUMBER, AGE, AND TUNE-UP CONDITION OF THE CARS; EXHAUST PIPE LOCATION, INTERIOR AIR-HANDLING EQUIPMENT; VEHICLE SEPARATION DISTANCES; AND NATURAL OR ARTIFICIAL BARRIERS THAT FORM TROUGHS OR PARTIAL ENCLOSURES IN WHICH VEHICULAR EMISSIONS CAN ACCUMULATE OR BE TRAPPED. IN A SERIES OF TYPICAL VEHICLE LINEUPS, LOCAL CARBON MONOXIDE (CO) CONCENTRATIONS WERE MEASURED. WITH SANTA CLARA VALLEY (CALIFORNIA) BACKGROUND LEVELS OF 2 TO 5 PPM, THE 15-MINUTE AVERAGE DRIVER-AREA CONCENTRATION LEVELS RANGED FROM 15 PPM TO 95 PPM WITH SHORT-TERM PEAKS BETWEEN 100 AND 1000 PPM. WIDE VARIATIONS IN CONCENTRATIONS CAN BE EXPECTED IF VENTILATING FANS FOR HEATER OR AIR-CONDITIONER UNITS ARE ALSO OPERATING. THE EXPOSURE OF HUMANS TO THESE CO CONCENTRATIONS CAN RESULT IN MILD HEADACHE OR NAUSEA, FAILURE TO REACT QUICKLY TO STIMULI (E.G. ONCOMING TRAFFIC), AS WELL AS SETTING A STRAIN ON THE HEART AND LUNGS. THESE EFFECTS ARE TEMPORARY AND REVERSIBLE. A FAR MORE SERIOUS LOCAL AIR QUALITY AND HEALTH PROBLEM ARISES IN THE GROWING PRODUCTION OF SULFUR OXIDES (SOX) AND SULFATE COMPOUNDS ATTRIBUTABLE TO THE LEGISLATED USE OF OXIDIZING CATALYTIC MUFFLERS FOR NEW CAR EMISSION CONTROL, AND OXIDATION OF THE ELEMENTAL SULFUR (S) FOUND IN ALL GASOLINE. USING THE CO LEVELS AS INDICATORS OF THE ACCUMULATION OF LOCAL AUTOMOBILE-PRODUCED POLLUTANTS WHEN A MAJORITY OF CARS ARE EQUIPPED WITH CATALYTIC CONVERTERS, THE ANTICIPATED ADVERSE EFFECTS OF SOX CONCENTRATIONS (IRRITATION AND INFLAMMATION OF HEALTHY LUNG TISSUE OF YOUNG AND OLD PEOPLE ALIKE, AS WELL AS AGGRAVATION OF PREEXISTING CONDITIONS OF LUNG OR HEART IMPAIRMENT) WILL BE A MOST UNDESIRABLE FEATURE OF DRIVE-UP FACILITY SERVICES. POTENTIAL REDUCTIONS IN THE EXTENT OF THIS DEVELOPING PROBLEM INCLUDE S REMOVAL, SOX TRAPS, AND EXHAUST SYSTEM REDESIGN.

by D. J. MYRONUK

Publ: WATER, AIR, AND SOIL POLLUTION V7 N2 P203-13 (FEB 1977)  
1977; 16REFS

Availability: SEE PUBLICATION

HS-023 444

# **DRIVING AND ENERGY CONSERVATION--HIGHLIGHT REPORT, VOL. 21**

A NATIONWIDE PROBABILITY SAMPLE SURVEY OF 1207 RESPONDENTS WAS CONDUCTED VIA TELEPHONE DURING THE PERIOD 26 NOV-21 DEC 1975 TO INVESTIGATE DRIVING HABITS AS RELATED TO ENERGY CONSERVATION. DATA FROM THE SURVEY INDICATE THAT MOST DRIVERS DRIVE IN WAYS THAT SAVE GASOLINE, AND THOSE THAT DO, KNOW THEY ARE BEING ENERGY-EFFICIENT. NINETY-SIX PERCENT STOP PRESSING GAS PEDALS WHEN THEY SEE A RED LIGHT; 84% PLAN SEVERAL ERRANDS FOR ONE TRIP (SAVES GASOLINE); 84% HAVE CAR ENGINES TUNED ONCE A YEAR (INCREASES CARS' MILEAGE); AND 84% DRIVE 55 MPH ON MAJOR HIGHWAYS (SAVES GASOLINE) THE EXCEPTION TO THIS GENERALLY ENERGY-EFFICIENT BEHAVIOR IS THE CHIEF WAGE EARNER GOING TO AND FROM WORK: 69% OF THESE INDIVIDUALS DRIVE THEMSELVES TO WORK AND DO NOT USE A CAR POOL OR TAKE PASSENGERS; ONLY 10% PARTICIPATE IN A CAR POOL OR TAKE PASSENGERS; 8% TAKE PUBLIC TRANSIT; AND 5% WALK TO WORK. HALF OF THE 69% WHO DRIVE TO WORK ALONE REALIZE THAT THEY ARE WASTING ENERGY.

OPINION RES. CORP., N. HARRISON ST., PRINCETON, N.J. 08540

FEA-CO-04-50236-00

Rept. No. PB-261 162; FEA/D-76/483; 1976; 29P

Availability: NTIS \$3.50-\$3.00

HS-023 445

# **THE IMPACTS OF URBAN TRANSPORTATION AND LAND USE POLICIES ON TRANSPORTATION ENERGY CONSUMPTION. FINAL REPORT. VOL. 1**

RELATIONSHIPS BETWEEN ENERGY CONSUMPTION IN URBAN PASSENGER TRAVEL, LAND USE, TRANSPORTATION SYSTEM CHARACTERISTICS, AND TRAVEL BEHAVIOR WERE EXPLORED BY CONDUCTING 112 EXPERIMENTS USING AN INTEGRATED, EQUILIBRIUM TRANSPORTATION-LAND USE SIMULATION MODEL. THIS MODEL SIMULATES URBAN GROWTH, IS SENSITIVE TO A BROAD RANGE OF TRANSPORTATION AND LAND-USE ACTIONS, ACCOUNTS FOR CONGESTION, ACCOMMODATES AUTO AND TRANSIT MODES, AND RESPONDS TO THE GENERALIZED COST OF TRAVEL. THREE CITY SHAPES WERE TESTED: CONCENTRIC RING, ONE-SIDED, AND POLYNUCLEATED. SIGNIFICANT IMPROVEMENTS IN ENERGY EFFICIENCY RESULTED FROM COORDINATION OF URBAN GROWTH WITH TRANSPORTATION NETWORK CAPACITY TO LIMIT CONGESTION. WHERE THE NETWORK PERMITTED, CENTRALIZED, CORRIDOR, AND NODAL GROWTH WERE FOUND MORE EFFICIENT THAN DISPERSED GROWTH. THE STRUCTURE OF THE TRANSPORTATION NETWORK WAS AN IMPORTANT FACTOR IN DETERMINING ENERGY EFFICIENCY; CRITICAL IMPROVEMENTS IN CONNECTIVITY REDUCED CONSUMPTION MORE EFFECTIVELY THAN SIMPLE CAPACITY INCREASES. THE ROLE OF PEAK HOUR TRANSIT SERVICE WAS FOUND VITAL TO LIMITING

TOTAL ENERGY CONSUMPTION. FURTHER TRANSIT IMPROVEMENTS FAILED TO IMPROVE ENERGY COSTS. CERTAIN LOW CAPITAL COSTS OPTIONS PRODUCED SUCH IMPORTANT ENERGY BENEFITS AS CAR POOLING AND INCREASED COMMUTER PARKING COSTS. VEHICLE MILES OF TRAVEL (VMT) IS A POOR INDICATOR OF ENERGY CONSUMPTION BECAUSE IT FAILS TO ACCOUNT FOR CONGESTION.

by ROBERT L. PESKIN; JOSEPH L. SCHOFER  
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ENGINEERING, EVANSTON, ILL. 60201  
DOT-OS-50118  
Rept. No. DOT-TST-77-85; 1977; 210P REFS  
Availability: NTIS

HS-023 446

#### **DELINEATION CONFERENCE. NARRATIVE SUMMARY. PT. 1-4 [ROADWAY MARKING]**

THE FIRST SUMMARY CONCERNS FACTORS INFLUENCING DELINEATION NEEDS AND DESIGNS; THE TOPICS DISCUSSED INCLUDE THE STATE OF THE PRACTICE, SAFETY ASPECTS, TRAFFIC CHARACTERISTICS, HUMAN FACTORS, AND LEGAL ASPECTS. THE SECOND SUMMARY CONCERNS OPTIMIZATION AND DESIGN; THE TOPICS DISCUSSED INCLUDE DESIGN REQUIREMENTS, OPTIMIZATION OF TRAFFIC LANE DELINEATION, MINIMUM PERFORMANCE STANDARDS, VISIBILITY, AND DRIVER EXPECTANCY. SUMMARY THREE CONCERNS DELINEATION SYSTEMS FOR ADVERSE WEATHER. THE FINAL SUMMARY CONCERNS DELINEATION MATERIALS; THE TOPICS DISCUSSED INCLUDE DURABILITY, QUICK DRY PAINTS, EPOXY AND POLYESTER MARKING MATERIALS, THERMOPLASTICS, BEADS, STRIPE ERADICATION, AND TEMPORARY MARKINGS. THE FORMAT OF EACH SUMMARY IS SUCH THAT IT CAN BE USED AS A SCRIPT FOR A SLIDE PRESENTATION (SLIDES AVAILABLE ON LOAN FROM THE FEDERAL HWY. ADMINISTRATION).

FEDERAL HWY. ADMINISTRATION, OFFICES OF RES. AND DEVEL., WASHINGTON, D.C. 20590  
Rept. No. FHWA-TS-78-219; 1978; 81P  
SUMMARY OF WESTERN CONFERENCE, SALT LAKE CITY, 28 FEB-3 MAR 1977 AND EASTERN CONFERENCE, WILLIAMSBURG, 15-18 MAR 1977.  
Availability: CORPORATE AUTHOR

HS-023 447

#### **COMPARISON OF OHIO STATE UNIVERSITY AND PENN STATE UNIVERSITY SKID SYSTEM WATER NOZZLES. FINAL REPORT [PAVEMENT SKID MEASUREMENT]**

TWO DESIGNS OF WATER NOZZLES USED ON PAVEMENT SKID MEASUREMENT SYSTEMS WERE COMPARED WITH REGARD TO THEIR PRECISION, ACCURACY, AND EASE OF ADJUSTMENT TO ASTM E-274-77 STANDARD. FOR SOME YEARS, MOST SKID MEASUREMENT SYSTEMS HAVE USED A WATERING NOZZLE OF THE DIVERGENT TYPE, WHICH HAS BEEN KNOWN AS THE PENN STATE UNIV. (PSU) DESIGN. DUE TO THE DIVERGENT NATURE OF THE PSU NOZ-

ZLE, IT HAS BEEN DIFFICULT, IF NOT IMPOSSIBLE, TO ADJUST THE WATER FLOW RATE FROM THE NOZZLE SUCH THAT IT WILL SATISFY THE ASTM STANDARD FOR PAVEMENT WETTING AT ALL SPEEDS. IN PARTICULAR, IF THE WATER FLOW RATE IS ADJUSTED PROPERLY AT 40 MPH IT WILL BE OUT OF SPECIFICATIONS AT 20 AND/OR 60 MPH. THE OHIO STATE UNIV. (OSU) ENGINEERING EXPERIMENT STATION HAS DEVELOPED A WORKING MODEL OF A NONDIVERGENT NOZZLE FROM A PREVIOUS CONCEPT BY THE STATE OF VIRGINIA. COMPARING THE PSU AND OSU SYSTEMS, IT WAS FOUND THAT THERE WERE NO SIGNIFICANT DIFFERENCES IN THE MEASURED SN (SKID NUMBER) ACCURACY AND PRECISION AT 20 AND 40 MPH. HOWEVER, AT 60 MPH, THE SN MEASUREMENT USING THE PSU NOZZLE AVERAGED MORE THAN ONE OVER THOSE OBTAINED WHEN USING THE OSU NOZZLE. THIS SIGNIFICANT DIFFERENCE DOES INDICATE THE EFFECT OF FLARING OUT THE WATER TRACE BY THE DIVERGENT NOZZLE AND THUS PLACING LESS THAN NORMAL WATER THICKNESS AHEAD OF THE TEST TIRE. THE ADJUSTMENT OF WATER FLOW RATE OF THE OSU NOZZLE WAS EASILY ACCOMPLISHED AT 20, 40, AND 60 MPH.

by A. J. STOCKER; J. W. ALBERT  
TEXAS A AND M UNIV., TEXAS TRANSPORTATION  
INST., COLLEGE STATION, TEX.  
DOT-FH-11-8889-MOD-1  
Rept. No. FHWA-RD-78-503; 1977; 69P 5REFS  
Availability: NTIS

HS-023 448

#### **DEVELOPMENT TRENDS FOR WROUGHT HIGH TEMPERATURE TURBINE ROTORS**

THE FEASIBILITY OF PRODUCING HIGH-PERFORMANCE WROUGHT INTEGRAL-BLADED AUTOMOTIVE TURBINE ROTORS FROM THE STRONGEST HIGH-TEMPERATURE SUPERALLOYS ON AN ECONOMICAL BASIS HAS BEEN DEMONSTRATED USING THE GATORIZING HOT-DIE FORGING PROCESS. THE PROCESS WORK IS PERFORMED AS A HOT ISOTHERMAL OPERATION WHERE BOTH THE DIES AND FORGING STOCK ARE HEATED TO THE ESTABLISHED FORGING TEMPERATURE AND MAINTAINED AT THAT TEMPERATURE DURING FORGING. THE ALLOY TO BE FORGED IS PLACED IN A TEMPORARY CONDITION OF LOW STRENGTH AND HIGH DUCTILITY (SUPERPLASTIC) AT THE FORGING TEMPERATURE AND FORGED TO THE DESIRED CONFIGURATION IN HOT DIES WHILE MAINTAINING THE SUPERPLASTIC CONDITION. SUBSEQUENT TO THE FORGING SEQUENCE, THE ALLOY MAY BE RESTORED TO A NORMAL CONDITION OF HIGH STRENGTH AND HARDNESS BY HEAT TREATMENT. PARTS OF COMPLEX GEOMETRY MAY READILY BE PRODUCED IN LIGHT-CAPACITY FORGING PRESSES. TO RETAIN THE ADVANTAGES ASSOCIATED WITH THE RELATIVELY SMALL-SIZE PRESSING EQUIPMENT REQUIRED, THE GATORIZING PROCESS STEP WHEREIN THE FORGING STOCK IS PROCESSED TO ESTABLISH THE DESIRED SUPERPLASTIC CONDITION HAS TYPICALLY BEEN DONE IN COMPRESSIVE WORKING EQUIPMENT DISTINCT FROM THE PRIMA-



RY FORGING PRESS. HOWEVER, THE ENTIRE PROCESS MAY BE AND HAS BEEN PERFORMED SEQUENTIALLY IN THE SAME PRESS, THE PROCESS PARAMETERS IN THE EARLY SEQUENCE OF THE FORGING OPERATION MERELY BEING SELECTED TO PROVIDE THE COMPRESSIVE WORKING LEADING TO THE LOW STRENGTH/HIGH DUCTILITY CHARACTERISTIC. THROUGH THE USE OF AVAILABLE ADVANCED PROCESSING TECHNIQUES, IT IS NOW POSSIBLE TO PRODUCE THE HIGH-PERFORMANCE WROUGHT INTEGRAL-BLADED TURBINE ROTORS WITH AN UNPRECEDENTED COMBINATION OF MECHANICAL PROPERTIES IN THE DISK OR ROTOR AND BLADES. THIS TECHNOLOGY BASE COUPLED WITH THE POTENTIAL FOR SIGNIFICANT IMPROVEMENT IN THE HIGH TEMPERATURE CAPABILITY OF SUPERALLOYS IN THE NEXT FEW YEARS OFFERS OPPORTUNITIES FOR SUPERALLOY TURBINE ROTORS THAT COULD BE COMPETITIVE WITH FIRST-GENERATION CERAMIC ROTORS. BY 1980 THE CAPABILITY OF A WROUGHT INTEGRAL-BLADED ROTOR COULD BE INCREASED 150°-200° F OVER THAT OF CURRENT CAST ROTORS.

by ROY L. ATHEY; JOSEPH B. MOORE  
PRATT AND WHITNEY FRDC  
Rept. No. SAE-770344; 1977; 11P  
PRESENTED AT INTERNATIONAL AUTOMOTIVE  
ENGINEERING CONGRESS AND EXPOSITION,  
DETROIT, 28 FEB-4 MAR 1977.  
Availability: SAE

HS-023 449

### LEGISLATION REGULATING AUTO REPAIR

SOME STATE RESPONSES TO THE PROBLEM OF CONSUMER DISSATISFACTION WITH THE QUALITY AND COST OF AUTOMOBILE REPAIRS ARE DISCUSSED. AUTO REPAIRS AND MAINTENANCE ARE COSTING THE CONSUMER AN ESTIMATED \$20 TO \$25 BILLION ANNUALLY. OVERCHARGING, NEEDLESS REPAIRS, SELLING USED PARTS AS NEW, METHOD OF COMPENSATING MECHANICS (COMMISSION BASIS), MISLEADING ADVERTISING, FRAUDULENT DISCOUNTS AND GUARANTEES, AND INACCURATE ESTIMATES ARE SOME OF THE MORE COMMON ABUSES WHICH CONSUMERS FACE. THESE TYPES OF AUTOMOBILE REPAIR ABUSES ARE OUTLINED, CITING SOME EXPERIENCES OF ATTORNEYS GENERAL AND DISCUSSING THE CONSTITUTIONAL ISSUES RAISED BY MECHANIC'S LIENS. THERE ARE PROBLEMS OF PROOF ENCOUNTERED WHEN COMMON LAW THEORIES ARE EMPLOYED TO SEEK RELIEF FOR CONSUMERS VICTIMIZED BY AUTOMOTIVE REPAIR FACILITIES. THERE ARE INDUSTRY-SPONSORED PROGRAMS TO CURB AUTOMOTIVE REPAIR ABUSES AND TO PROVIDE AN ALTERNATIVE TO STATE REGULATION OF AUTOMOTIVE REPAIR TRANSACTIONS; THERE ARE ALSO REASONS FOR INDUSTRY OPPOSITION TO STATE REGULATION OF THE AUTOMOTIVE REPAIR INDUSTRY. SPECIFIC REGULATORY PROVISIONS FOR THE LICENSING AND DAILY OPERATION OF AUTOMOTIVE REPAIR FACILITIES ARE DISCUSSED, IN ADDITION TO STATE LEGISLATIVE ACTIONS DESIGNED TO ERADICATE AUTOMOTIVE REPAIR ABUSES. TABLES LIST STATES THAT HAVE SOME FORM OF GENERAL CONSUMER

PROTECTION LEGISLATION, LIST STATES THAT HAVE ADOPTED SPECIFIC LEGISLATION TO REGULATE AUTOMOTIVE REPAIR, AND OUTLINE PARTICULAR CHARACTERISTICS OF STATE AUTO REPAIR LEGISLATION. THE OHIO CONSUMER SALES PRACTICES ACT IS USED TO ILLUSTRATE A STATE THAT APPLIES ITS CONSUMER PROTECTION STATUTE TO COMPLAINTS ABOUT AUTO REPAIRS, AND THE MICHIGAN MOTOR VEHICLE SERVICE AND REPAIR ACT IS USED TO ILLUSTRATE THE APPROACH USED BY A FEW STATES TO ENACT SPECIFIC AND COMPREHENSIVE LEGISLATION REGULATING THE AUTO REPAIR INDUSTRY. IT IS HOPED THAT EXISTING AUTO REPAIR LAWS WILL PROVIDE A FOUNDATION UPON WHICH OTHERS MAY BUILD AND IMPROVE.

by REGINALD L. WATKINS  
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ON THE OFFICE OF ATTORNEY GENERAL, 3901  
BARRETT DR., RALEIGH, N.C. 27609  
1976; 52P REFS  
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Availability: CORPORATE AUTHOR \$3.00

HS-023 450

### MOTOR CARRIER CARGO LOSS ESTIMATION AND DATA ANALYSIS. FINAL REPORT

AS PART OF THE INTERSTATE COMMERCE COMMISSION'S (ICC) CARGO SECURITY DATA BASE DEVELOPMENT PROJECT, A STUDY WAS UNDERTAKEN TO ASSESS THE ADEQUACY OF THE ICC REGULATED MOTOR CARRIER CARGO LOSS DATA AS A SAMPLE BASE REPRESENTATIVE OF THE INDUSTRY-WIDE CARGO LOSS EXPERIENCE, AND TO DEVELOP MEANINGFUL STATISTICS TO REFLECT THE LOSS BEHAVIOR OF THE INTERCITY MOTOR CARRIERS. FIRST, A METHOD WAS DEVELOPED FOR ACCURATELY QUANTIFYING THE MAGNITUDE OF THE THEFT PROBLEM TO INCLUDE THE NONREGULATED WORLD OF THE INTERCITY MOTOR CARRIER INDUSTRY. BASED ON A RANDOM SAMPLE OF 134 REGULATED MOTOR CARRIERS, THE METHOD GAVE RISE TO A STANDARD ERROR OF A LITTLE MORE THAN 5%, RESULTING IN A 95% PROBABILITY THAT THE INTERCITY THEFT-RELATED CARGO LOSS VALUE LIES SOMEWHERE IN THE INTERVAL (\$265 MILLION, \$330 MILLION). THE SECOND ASPECT OF THE STUDY INVOLVED THE ASSESSMENT OF THE DATA ON WHICH THE METHOD IS BASED, INCLUDING THE VERIFICATION OF THE REPRESENTATIVENESS OF THE REGULATED MOTOR CARRIERS FOR THE ENTIRE INDUSTRY IN THEIR CARGO LOSS EXPERIENCE. THEFT-RELATED LOSS WAS FOUND TO BE COMMODITY-SPECIFIC. BULK COMMODITIES OR COMMODITIES WHICH ARE OFTEN SHIPPED IN TRUCKLOADS ENCOUNTER MUCH LESS RISK THAN MANUFACTURED CONSUMER ITEMS. THE AVERAGE THEFT-RELATED LOSS RATIO IS LOWER FOR THE NONREGULATED CARRIERS OF SPECIAL COMMODITIES. SIGNIFICANT DIFFERENCE EXISTS BETWEEN THOSE REGULATED CARRIERS REPRESENTED BY THE ICC DATA AND THOSE EXCLUDED FROM IT: AN ESTIMATED 8% UPWARD BIAS IN THE NATIONAL ESTIMATE IS APPARENT BECAUSE THE SAMPLE TAKEN FROM THE REGULATED SEGMENT

REPRESENTS ONLY THE UPPER SPECTRUM OF THE MOTOR CARRIER INDUSTRY. THE MISSING ELEMENTS, THE SMALLER CARRIERS, ARE BELIEVED TO HAVE LOWER, BUT LESS STABLE, CARGO LOSS RATIOS. THE PROBLEM OF HIJACKING WAS FOUND TO BE MOST ACUTE ON THE EAST COAST, PARTICULARLY IN NEW ENGLAND AND THE MID-ATLANTIC REGION.

by BETTY KWOK; JOEL MICHALEK  
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Rept. No. DOT-TSC-RSPD-78-3; 1978; 80P 25REFS  
REPT. FOR APR 1976-JAN 1977.  
Availability: NTIS

HS-023 451

### **THE EFFECT OF THE OIL CRISIS ON THE GROWTH IN THE OWNERSHIP AND USE OF CARS [UNITED KINGDOM]**

A STUDY OF CAR PRICES BY AGE AND SIZE, STARTING FROM 1957 ANNUALLY (AND SINCE THE OIL CRISIS OF 1973, EVALUATED MONTHLY) HAS ENABLED AN EXAMINATION OF THE STRONG CHANGE IN TREND THAT HAD OCCURRED, WITH LARGE CARS DEPRECIATING 15% PER ANNUM MORE THAN THE SMALLEST CARS. THE QUANTITIES OF CARS OF EACH SIZE REGISTERED EACH MONTH ARE AVAILABLE FROM BRITISH NATIONAL STATISTICS WHICH SHOW THAT THE PREVIOUS 1% PER ANNUM INCREASE IN CAR SIZE WAS ARRESTED, WITH NEW CARS BECOMING SUBSTANTIALLY SMALLER. A MODEL OF THE CAR MARKET HAS BEEN DEVELOPED WHICH RELATES, ON THE ONE HAND, THE PRICE DISTRIBUTION OF CARS BY AGE, AND ON THE OTHER HAND, THE PRICE DISTRIBUTION OF THE STOCK OF CARS OWNED AT EACH HOUSEHOLD INCOME LEVEL. VIA THE EXPENDITURE ON CAR PURCHASE AT EACH HOUSEHOLD INCOME LEVEL AND THE DISTRIBUTION OF THE LENGTH OF TIME BETWEEN PURCHASE AND RESALE OF CARS, A FULLY DYNAMIC MODEL HAS BEEN DEVELOPED TO RELATE EXPENDITURE FLOW AND STOCK. THIS ENABLES THE EXAMINATION OF THE EFFECT OF DIFFERENT TRENDS ON THE DYNAMIC EQUILIBRIUM IN THE CAR MARKET. THE STANDSTILL SINCE THE OIL CRISIS IS ATTRIBUTED TO GASOLINE PRICES VIA THE SPLIT IN HOUSEHOLD EXPENDITURE BETWEEN PURCHASE AND USE. IN THE SHORT TERM, THE PRICE ELASTICITY OF GASOLINE IS VERY LOW; IN THE LONG TERM, IT IS TAKEN UP BY AN ADJUSTMENT IN CAR SIZE. CONVERSELY, A RISE IN NEW CAR PRICE (THROUGH MATERIAL OR LABOR COSTS) HAS BOTH A SHORT-TERM EFFECT DEPRESSING NEW CAR SALES, AND A LONG-TERM EFFECT WHERE THIS IS OFFSET AGAIN. IT WOULD BE PRUDENT TO ENSURE THAT THE SIZE OF NEW CARS IS MAINTAINED AS SMALL AS POLITICALLY ACCEPTABLE, BY HIGHER TAXATION ON CAR PURCHASE AND HIGHER TAXATION ON GASOLINE, SO THAT THE WORLD'S OIL AND MATERIAL STOCKS CAN BE MAINTAINED LONGER. THIS WILL NOT CHANGE EITHER THE LONG-TERM OWNERSHIP OR THE LONG-TERM USE OF CARS MUCH; THERE WILL

BE SOME EFFECT, OF COURSE, SINCE THE SHORT-TERM ELASTICITIES ARE NOT THE SAME AS THE LONG-TERM ONES, SO THE TIME-PATH WILL DEPEND ON HOW AND WHEN TAXATION RATES ARE CHANGED. THE HIGHER TAX REVENUE COULD BE USED TO OFFSET THE BALANCE OF PAYMENTS DEFICIT CAUSED BY THE OIL IMPORTS, AND TO CUSHION THE ECONOMY AGAINST OIL PRICE RISES IN THE SHORT TERM BY REDUCING TAX AGAIN; AND COULD BE USED TO CUSHION THE EFFECTS OF INCREASING CAR OWNERSHIP ON THE PUBLIC TRANSPORT SERVICES, OR RATHER ON THOSE WITHOUT CARS.

by M. J. H. MOGRIDGE  
Publ: TRANSPORTATION V7 N1 P45-67 (1978)  
1978; 27REFS  
Availability: SEE PUBLICATION

HS-023 452

### **THE INFLUENCE OF HABIT FORMATION ON MODAL CHOICE--A HEURISTIC MODEL [TRIP DECISION-MAKING BY CAR OWNERS]**

CONCEPTUAL AND EMPIRICAL INFORMATION FROM A WIDE RANGE OF SOURCES IS INTEGRATED TO ARRIVE AT AN APPROACH TO VEHICLE TRIP MODELING, IN PARTICULAR TO MODAL SPLIT MODELING, THAT IS BASED ON THE LEARNING PROCESSES AND HABIT FORMATION OF THE TRIP-MAKER. THE THEORY SUGGESTED IS BASED ON A FOUR-STAGE PROCESS WITHIN THE OVERALL DECISIONMAKING FRAMEWORK (DECISION TO ACQUIRE A CAR, DETERMINATION OF CAR AVAILABILITY, DECISION TO USE THE CAR, AND ALLOCATION BETWEEN MODES). SOME OF THESE STAGES CAN BE OMITTED IN SUBSEQUENT MODEL RUNS AS A RESULT OF LEARNING AND REINFORCEMENT OF ESTABLISHED ROUTINES AND THE FORMATION OF HABITS. EVIDENCE TO SUPPORT THIS CONCLUSION IS AVAILABLE IN THE FORM OF LOW VALUES OF CROSS-ELASTICITY AND DIRECT ELASTICITY OF DEMAND WITH RESPECT TO PRICE FOR PRIVATE AND PUBLIC TRANSPORT MODES. THE OUTLINED MODEL IS ESSENTIALLY HEURISTIC IN NATURE, BASED ON A SEQUENTIAL SERIES OF DECISIONS MADE BY MEMBERS WITHIN EACH HOUSEHOLD. IT COMBINES THE CONCEPTS OF MOBILITY AND CAR AVAILABILITY AND DEMONSTRATES THAT AFTER A LEARNING PERIOD, DECISIONS MAY BE A FUNCTION OF HABIT AND EXPERIENCE IN TERMS OF SATISFACTORY OUTCOMES FROM PREVIOUS TRIPS. THIS HAS MEANT THAT PERSONAL MOBILITY, IN TERMS OF VEHICLE TRIPS AND A PREVAILING CLIMATE OF MINIMAL POLICY INTERVENTION, HAS BECOME INCREASINGLY MORE DEPENDENT ON CAR OWNERSHIP, LICENSE HOLDING, AND CAR AVAILABILITY AND LESS DEPENDENT UPON THE "COMPETITIVE" ADVANTAGES OF ALTERNATIVE MODES.

by DAVID BANISTER  
Publ: TRANSPORTATION V7 N1 P5-18 (1978)  
1978; 40REFS  
Availability: SEE PUBLICATION

HS-023 453

**AUTOMOTIVE WHEELS: STEEL, ALUMINUM, OR FRP? [FIBER-REINFORCED PLASTICS]**

WITHIN THE NEXT TEN YEARS, MORE AUTOMOTIVE WHEELS OF ALUMINUM, HIGH-STRENGTH STEELS, AND EVEN FIBER-REINFORCED PLASTICS (FRP) WILL BE SEEN ON THE MARKET. THESE WHEEL OPTIONS RESPOND TO PROGRAMS OF WEIGHT REDUCTION, NEW SPACE-EFFICIENT FRONT-WHEEL DRIVE DESIGNS, NEW TIRE PROFILES, RUN-FLAT CONCEPTS, AND DEDICATED SPARES. MARKETING ENTERS THE PICTURE AS WELL; AS CAR DESIGNS REFLECT REGULATION WITH INCREASED COMMONALITY, WHEELS ASSUME A MORE IMPORTANT ROLE IN ESTABLISHING MARQUE IDENTIFICATION. WHILE THE BASIC FUNCTION OF A WHEEL REMAINS UNCHANGED, VEHICLE DESIGN TRENDS ARE HAVING A PROFOUND EFFECT ON OPTIMIZING THIS FUNCTION. HIGH-STRENGTH STEEL WHEELS OFFER PERHAPS THE FEWEST DEVELOPMENT PROBLEMS, BUT PROBABLY THE LEAST WEIGHT REDUCTION. OF LIGHTWEIGHT CANDIDATES, ALUMINUM HAS THE BROADEST DATA BASE, BUT NOT NECESSARILY THE LOWEST ULTIMATE COST. FRP MIGHT OFFER THE BEST TRADE-OFF OF WEIGHT AND COST, BUT AT THIS POINT IT HAS THE LARGEST COLLECTION OF UNKNOWN.

by DENNIS SIMANAITIS

Publ: AUTOMOTIVE ENGINEERING V86 N6 P32-7 (JUN 1978)

1978

Availability: SEE PUBLICATION

HS-023 454

**MERCEDES TURBOCHARGES FIVE-CYLINDER DIESEL [ENGINE]**

A TURBOCHARGED VERSION OF ITS FIVE-CYLINDER PASSENGER CAR DIESEL ENGINE HAS BEEN INTRODUCED BY DAIMLER-BENZ, IN WHICH THE OUTPUT OF THE THREE-LITER POWERPLANT IS INCREASED BY 43% WITH ONLY 7% ADDED ENGINE WEIGHT. INSTALLED IN THE LARGE (1765 KG) SEDANS IT ACHIEVES A COMBINED FUEL CONSUMPTION AVERAGE OF 9 L/100 KM (26 MPG). ZERO-TO-96 KM/H (0-60 MPH) ACCELERATION OF THE HEAVIER SEDAN IS 14.0 SEC, COMPARED WITH THE NATURALLY ASPIRATED SMALLER SEDAN'S 21.2 SEC. A SLIGHTLY MODIFIED VERSION OF THE INDIRECT-INJECTION PRECHAMBER COMBUSTION SYSTEM IS USED; THE FUEL INJECTION SYSTEM WAS ADAPTED TO THE INCREASED FUEL QUANTITY REQUIRED FOR A TURBOCHARGED ENGINE, PERMITTING A LONGER INJECTION PERIOD WHICH REDUCES OXIDES OF NITROGEN AND SMOKE EMISSIONS. AT FULL BOOST, MAIN CHAMBER MAXIMUM PRESSURE DOES NOT EXCEED 9.6 MPA (1375 PSI), AS COMPARED TO THE NATURALLY ASPIRATED ENGINE'S MAXIMUM OF 6.5 MPA (950 PSI). THE CRANKSHAFT IS BATH-NITRIDED, INCREASING HARDNESS AND DOUBLING FATIGUE STRENGTH UNDER ALTERNATING LOAD. PHOTOGRAPHS AND DIAGRAMS OF THE OIL-COOLED PISTON WITH PRESSURE-DIE-CAST ALUMINUM JETS ARE PROVIDED AS WELL AS A DIAGRAM OF THE

COMPLETE ENGINE LUBE SYSTEM. THE OIL JETS SHOOT A STREAM OF OIL UPWARD INTO A SPECIALLY DESIGNED OIL COLLECTING HOLE IN EACH PISTON WHICH CARRIES THE OIL INTO THE COOLING GALLERY. A NEW OIL PUMP SYSTEM, WITH A CHAIN-DRIVEN GEAR-TYPE PUMP LOCATED IN THE OIL SUMP, WAS DEVELOPED TO HANDLE THE ROUGHLY DOUBLE QUANTITY OF OIL REQUIRED. IMPROVED DISSIPATION OF HEAT INTO THE CYLINDER HEAD COUNTERACTS THE ADDITIONAL THERMAL LOADING OF THE BURNER (LOWEST PART OF THE PRECHAMBER INSERT). THE ROBERT BOSCH FIVE-CYLINDER IN-LINE PUMP IS THE BASIC MODEL OF THE TURBOCHARGED ENGINE'S INJECTION PUMP, MODIFIED FOR HIGHER PERFORMANCE, WITH AN ANEROID FOR MEASURING ABSOLUTE MANIFOLD PRESSURE. FOR EXHAUST GAS FLOW AT UPPER SPEED RANGES, THE WASTEGATE IS IN THE TURBINE SIDE. AT ENGINE SPEEDS ABOVE 1600 RPM COMPRESSOR EFFICIENCIES HIGHER THAN 65% ARE OBTAINABLE. ADDITIONAL DIAGRAMS DISPLAY THE TURBO UNIT AND THE WASTEGATE ASSEMBLY. MODIFICATIONS IN THE TRANSMISSION ARE DESCRIBED, AS WELL AS MINOR MODIFICATIONS TO THE GLOW PLUGS, INJECTION PUMP DRIVE, VACUUM PUMP, ALTERNATOR, AIR-CONDITIONING COMPRESSOR AND POWER STEERING PUMP, AND COOLING THERMOSTAT HOUSING.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P40-5 (JUN 1978)

1978

BASED ON SAE-780633, "THE TURBOCHARGED FIVE-CYLINDER DIESEL ENGINE FOR THE MERCEDES-BENZ 300 SD," BY KURT OBLANDER, MANFRED FORTNAGEL, HANS-JUERGEN FEUCHT, AND ULRICH CONRAD; PRESENTED AT SAE PASSENGER CAR MEETING, TROY, MICH., 5-9 JUN.

Availability: SEE PUBLICATION

HS-023 455

**REDESIGNED STEEL PARTS REDUCE WEIGHT**

A PRACTICAL WAY TO OBTAIN VEHICLE WEIGHT REDUCTION IN MEETING GOVERNMENT FUEL ECONOMY STANDARDS IS TO USE LIGHTER GAUGE, HIGHER STRENGTH STEELS WITH LITTLE OR NO DESIGN CHANGE. SUCH USE IS OFTEN PRACTICAL WHEN DEFLECTION OR BUCKLING ARE NOT PROBLEMS, AND SOME HIGH-STRENGTH STEELS HAVE A STRENGTH-TO-COST RATIO ADVANTAGE OVER LOW CARBON STEEL. SIMPLY ADDING FLANGES TO A FLEXURAL OR COMPRESSION MEMBER IS OFTEN AN EFFECTIVE WAY TO INCREASE STRUCTURAL EFFICIENCY, PREVENT BUCKLING, AND REDUCE WEIGHT. EXAMPLES ARE GIVEN IN WHICH THE REDESIGNED PIECE HAS THE SAME FLEXURAL STRENGTH AS THE ORIGINAL, WITH A WEIGHT REDUCTION AND COST SAVING. WHERE POSSIBLE, THE USE OF DEEPER SECTIONS CAN ALSO IMPROVE EFFICIENCY. PARTS CONSOLIDATION CAN BE A WEIGHT-SAVER, AS CAN THE REAPPORTIONMENT OF MATERIAL TO THE AREA OF THE LOAD. ENSURING INTEGRAL ACTION OF ASSEMBLED COMPONENTS CAN ALSO MAKE WEIGHT REDUCTION

POSSIBLE. A NUMBER OF SUCH REDESIGNED STRUCTURES ARE ILLUSTRATED.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P46-9 (JUN 1978)  
1978

BASED ON A PAPER TITLED "COST-EFFECTIVE WEIGHT REDUCTION USING STEEL," BY SAMUEL J. ERRERA.

Availability: SEE PUBLICATION

HS-023 456

#### **SHOULD EUROPE ADOPT A MODIFIED FTP? [FEDERAL TEST PROCEDURE]**

A MODIFIED VERSION OF THE FEDERAL TEST PROCEDURE'S (FTP) DRIVING CYCLE HAS BEEN PROPOSED BY VOLKSWAGEN ENGINEERS AS REPLACEMENT FOR EUROPE'S CURRENT EMISSION TEST CYCLE. ANALYSIS OF TRAFFIC PATTERNS IN THREE EUROPEAN URBAN AREAS SHOWS THAT THE CURRENT EUROPEAN CYCLE IS UNSATISFACTORY AS A REFLECTION OF ACTUAL DRIVING CONDITIONS. A COMPARISON IS MADE OF THE PRESENT CYCLE WITH THE FTP REGARDING ORIGINS, DURATION, EMISSION COLLECTION, AND DRIVING PATTERNS. DATA COMPILED IN TURIN, STUTTGART, AND VERSAILLES SHOW THAT IN ALMOST EVERY CRITERION THE EUROPEAN CYCLE IS LESS THAN ADEQUATE, WHEREAS THE FTP'S BASIC CYCLE REFLECTED VALUES IDENTIFIED IN THE URBAN STUDIES. AN ATTEMPT WAS MADE TO MODIFY THE FTP CYCLE INTO ONE FITTING THE URBAN DATA EVEN BETTER, AND TO REDUCE ITS RUNNING TIME WITHOUT COMPROMISING IMPORTANT FEATURES OF COLD-START EVALUATION. A COMPUTER PROGRAM TO EVALUATE SIXFOLD COMBINATIONS OF THE 17 SEGMENTS MAKING UP THE FTP RESULTED IN AN FTP-BASED CYCLE CLOSELY MATCHING KINEMATIC DATA FROM EUROPEAN URBAN STUDIES. A CHANGE WAS ALSO PROPOSED IN EUROPE'S SINGLE-BAG COLLECTION OF EMISSIONS; TO FACILITATE SEPARATE ASSESSMENTS OF COLD-START AND HOT-START PHASES, A SEPARATE COLLECTION WOULD BE MADE FOR EACH ITERATION OF THE PROCEDURE, AND FINAL EMISSION CALCULATIONS WOULD INVOLVE WEIGHTED VALUES FROM COLD-START AND HOT-START PORTIONS. IN RUNNING THE PROPOSED CYCLE, A CAR TYPICALLY ACCELERATES QUICKLY FROM STANDSTILL TO SPEEDS RANGING FROM 15 TO 30 KM/H; MAXIMUM ACCELERATIONS ARE IN THE RANGE OF 1.5 M/SQ SEC. FREQUENCY IS WIDESPREAD IN THE SPEED RANGE OF 20-50 KM/H AND ACCELERATION RANGE OF 1 M/SQ SEC. ACCELERATIONS AND DECELERATIONS IN THE 50-70 KM/H RANGE ARE MODERATE, BUT THE FREQUENCY INCREASES AGAIN AROUND 80 KM/H. ALL SPEEDS EXCEEDING 50 KM/H OCCUR DURING THE FREEWAY SIMULATION. AT ITS LOWER END, THE CYCLE REFLECTS CENTRAL-CITY DATA, YET IT ALSO CONTAINS ENOUGH HIGH SPEED AND HEAVY

ACCELERATION TO GIVE A FULL PICTURE OF EUROPEAN URBAN CONDITIONS.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P50-3 (JUN 1978)  
1978

BASED ON SAE-780650, "IMPROVED DRIVING CYCLE FOR TESTING AUTOMOTIVE EXHAUST EMISSIONS," BY M. KUHLE AND D. KARSTENS; PRESENTED AT PASSENGER CAR MEETING, TROY, MICH., 5-9 JUN. Availability: SEE PUBLICATION

HS-023 457

#### **COMPUTER STUDY AIDS AUTOMOTIVE GAS TURBINE**

A GENERALIZED COMPUTER CODE, THE NAVY/NASA ENGINE PROG. (NNEP), USED FOR ANALYSIS OF AIRCRAFT GAS TURBINES, HAS BEEN MODIFIED FOR AUTOMOTIVE USE BY SWITCHING FLOW PATHS OR MECHANICAL ARRANGEMENTS TO SIMULATE POWER TRANSFER AMONG SHAFTS. NNEP CAN SYNTHESIZE NEARLY ANY CONFIGURATION AND ITS OPERATIONAL CONTROLS. SUBROUTINES HAVE BEEN ADDED TO FACILITATE AUTOMOTIVE ANALYSIS, FOR GENERATING PRELIMINARY COMPRESSOR AND TURBINE DESIGN CHARACTERISTICS, AND FOR OUTPUTTING ENGINE PERFORMANCE MAPS FOR USE WITH A DRIVING-CYCLE ANALYSIS COMPUTER CODE. IN THE APPLICATION OF TURBOMACHINERY TO THE GAS TURBINE ENGINE THE POTENTIAL EFFECT OF SMALL SCALE ON PERFORMANCE WAS INVESTIGATED; A VARIETY OF STUDIES INDICATES THAT IF PERFORMANCE TRENDS CONTINUE WITH DOWN-SIZING, AN AXIAL FLOW COMPRESSOR WOULD SUFFER A LARGER REDUCTION IN EFFICIENCY THAN WOULD A CENTRIFUGAL TYPE. THE HIGH INLET AND OUTLET COMBUSTOR TEMPERATURES REQUIRED FOR REGENERATIVE AUTOMOTIVE GAS TURBINE ENGINES HAVE RESULTED IN BOTH FAVORABLE AND UNFAVORABLE EFFECTS ON THE COMBUSTION PROCESS; THE HIGH TEMPERATURES ARE CONDUCIVE TO HIGH COMBUSTION EFFICIENCIES AND HENCE LOW HYDROCARBON AND CARBON MONOXIDE EMISSIONS, BUT THE TEMPERATURES ALSO INCREASE FORMATION OF OXIDES OF NITROGEN (NOX). THE PRINCIPLE OF THE MULTI-ELEMENT COMBUSTOR CONCEPT IS NOX REDUCTION BY COOLING THE FLAME TO PREVENT THE ADIABATIC FLAME TEMPERATURE FROM BEING REACHED, AND ELEVATION OF THE HOT GAS VELOCITIES THROUGH THE COMBUSTOR BY THE USE OF TURBULENT FLAME HOLDING TO REDUCE THE FLAME RESIDENCE TIME. EMISSION MEASUREMENTS FROM THE SINGLE ELEMENT TESTS, EXTRAPOLATED TO A MULTI-ELEMENT UNIT SIZED FOR AUTOMOTIVE USE SHOW PROMISE FOR NOX CONTROL. THE AVAILABILITY OF HIGH-TEMPERATURE, LOW-COST MATERIALS FOR THE BURNER AND TURBINE COMPONENTS IS CRITICAL FOR THE NEEDS OF FUEL-EFFICIENT, HIGH-PERFORMANCE GAS TURBINE ENGINES; CERAMICS OFFER THE BEST POTENTIAL FOR THESE REQUIREMENTS BECAUSE OF THEIR LOW COST AND LOW DENSITY AS WELL AS THEIR HIGH STRENGTH AT OPERATING TEMPERATURES UP TO 1400° C OR MORE. THE MOST PROMISING SEEM TO BE SILICON NITRIDE AND SIL-

December 31, 1978

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ICON CARBIDE, WHICH HAVE THE MOST FAVORABLE RESISTANCE TO THERMAL SHOCK AND ARE MUCH MORE OXIDATION RESISTANT THAN THE SUPER-ALLOYS.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P56-60 (JUN 1978)

1978  
BASED ON SAE-780075, "AN OVERVIEW OF AEROSPACE GAS TURBINE TECHNOLOGY OF RELEVANCE TO THE DEVELOPMENT OF THE AUTOMOTIVE GAS TURBINE ENGINE," BY D. G. EVANS AND T. J. MILLER; PRESENTED AT SAE CONGRESS, DETROIT, 27 FEB-3 MAR.  
Availability: SEE PUBLICATION

HS-023 458

### SILICONES SUCCESSFUL IN BRAKE FLUID FIELD TESTS

EARLY LABORATORY TESTS DEMONSTRATED THE DESIRABLE PROPERTIES OF SILICONE BRAKE FLUIDS; DOW ENGINEERS FOLLOWED UP WITH A PROGRAM OF FIELD TESTS INVOLVING 168 VEHICLES, MORE THAN SEVEN YEARS, AND SOME 4 MILLION KM. THREE METHODS OF INCORPORATING SILICONE FLUID WERE USED: MIXING OF SILICONE AND ORIGINAL EQUIPMENT MANUFACTURER (OEM) FLUIDS, FLUSH/FILLS, AND COMPLETE REBUILDS. TO A GREAT EXTENT, SILICONE BENEFITS WERE DIRECTLY PROPORTIONAL TO THE EFFICACY OF ITS REPLACING OEM FLUID. THOUGH FLUSH/FILLS WERE ONLY PARTLY SUCCESSFUL IN REPLACING OEM FLUID WITH SILICONE, IMPROVED LOW-TEMPERATURE PEDAL RESPONSE, EASIER MODULATION, AND BETTER OVERALL CONTROL WERE REPORTED, AND ATTRIBUTED TO LOWER VISCOSITY OF SILICONE FLUID, PARTICULARLY AT LOW AMBIENT TEMPERATURE. THE STRONG INFLUENCE OF RESIDUAL OEM FLUID IN FLUSH/FILLS WAS NOTED; ANTI-CORROSION AND LONG-WEAR BENEFITS SEEMED PROPORTIONAL TO SILICONE CONTENTS, WHILE RESISTANCE TO VAPOR LOCK REMAINED A FUNCTION OF RESIDUAL OEM FLUID PROPERTIES. BECAUSE OF THE COST AND COMPLEXITY OF SYSTEM REBUILDS, ONLY 25 VEHICLES WERE TESTED IN "PURE SILICONE" FORM. ONE SUCH VEHICLE, A 1970 CHEVELLE, WAS PART OF AN SAE RESEARCH PROJECT EVALUATING MOISTURE PICKUP IN BRAKE FLUIDS. AFTER TWO YEARS AND SOME 90,000 KM, PHYSICAL PROPERTIES OF THE SILICONE FLUID WERE UNCHANGED. WATER CONTENT WAS 0.00%; SYSTEM WEAR AND CORROSION NONEXISTENT. RESEARCHERS EMPHASIZE THE NEAR PERFECT FIT OF SILICONE BRAKE FLUID PROPERTIES AND IDEAL CRITERIA, NOTING THAT EXAMINATION OF HARDWARE INDICATES: MIXTURES OF SILICONE AND GLYCOL WILL OPERATE WITH NO ADVERSE CHEMICAL OR PHYSICAL EFFECTS; SILICONE FLUSH/FILLS REDUCE CORROSION AND WEAR, AND IMPROVE BRAKE PERFORMANCE; FULL BENEFITS OF SILICONE FLUIDS COME ONLY WITH ORIGINAL

FILLS, AND INCLUDE ELIMINATION OF SYSTEM WEAR AND CORROSION FOR AT LEAST 110,000 KM.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P63-5 (JUN 1978)

1978  
BASED ON SAE-780661, "SILICONE BRAKE FLUIDS: SHOW US THE HARDWARE" BY G. W. HOLBROOK AND J. K. VAN SLOUN; PRESENTED AT PASSENGER CAR MEETING, TROY, MICH., 5-9 JUN 1978.  
Availability: SEE PUBLICATION

HS-023 459

### HOMOGENEOUS MIXTURES MAY NOT BE OPTIMAL FOR LEAN COMBUSTION

RESEARCHERS STUDYING THE EFFECTS OF MIXTURE PREPARATION ON STEADY-STATE COMBUSTION FOUND AN INJECTED FUEL/AIR MIXTURE EVEN BETTER THAN A PRE-VAPORIZED ONE IN TERMS OF LEAN LIMITS, COMBUSTION PRESSURE VARIATIONS, AND SPECIFIC FUEL CONSUMPTION. RESEARCHERS IDENTIFIED A MIXTURE CONDITION THAT GAVE SUBSTANTIAL IMPROVEMENT IN LEAN MISFIRE LIMIT (LML), EVEN COMPARED TO THAT OF THE PREMIXED CHARGE. GRAPHS DEMONSTRATE THIS AND THE SUPERIORITY OF THE HETEROGENEOUS MIXTURE (BIT) IN OBTAINING QUICK COMBUSTION. FOR ANY GIVEN SPARK TIMING, BIT WAS FOUND TO RUN LEANEST, FOLLOWED BY THE PREVAPORIZED CHARGE, WITH WORST MIXTURES (WIT) LAST. PARTIAL-BURN TESTS SHOWED SOMEWHAT SMALLER DIFFERENCES. CONCLUSIONS WERE THAT THOUGH IT HELPED BOTH, THE BIT PREPARATION SEEMED TO ENHANCE SPARK INITIATION MORE THAN IT DID FLAME PROPAGATION. WHILE PARTIAL BURNS OF THE BIT MIXTURE WERE OCCURRING AT ITS LML, IT IS SUGGESTED THAT ENGINE DESIGN CHANGES COULD INCREASE THE BURNING RANGE, THEREBY MOVING THE PARTIAL-BURN LIMIT TO LEANER MIXTURES. FURTHER TESTS OF COMBUSTION GENERALLY CONFIRMED THE BENEFICIAL CHARACTERISTICS OF THE BIT MIXTURE. TWO FACTORS, BULK STRATIFICATION AND DROPLET SIZE, ARE PROPOSED AS CAUSES, WITH EMPHASIS PLACED ON AN OPTIMAL SIZE OF DROPLETS GIVING BETTER INITIATION AND IMPROVED FLAME PROPAGATION IN LEAN HETEROGENEOUS MIXTURES.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P66-70 (JUN 1978)

1978; 1REF  
BASED ON SAE-780234, "'WETTING' THE APPETITE OF SPARK IGNITION ENGINES FOR LEAN COMBUSTION," BY BRUCE D. PETERS AND ATER A. QUADER; PRESENTED AT SAE CONGRESS, DETROIT, 27 FEB-3 MAR 1978.  
Availability: SEE PUBLICATION

HS-023 460

### INSULATED PISTONS RAISE DIESEL EFFICIENCY

AN INSULATED PISTON, KEY ELEMENT OF AN ADIABATIC ENGINE, IS DESCRIBED, WITH INITIAL ENGINE TEST RESULTS. THE DESIGN COMPRISES A

CERAMIC TOP SUPPORTED WITH A CONVENTIONAL ALUMINUM BASE, THE TWO COMPONENTS SEPARATED BY A HIGHLY INSULATING LAYER. THE COMPONENTS ARE BOLTED TOGETHER, WITH BELLEVILLE SPRINGS USED TO COMPENSATE FOR DIFFERENTIAL LONGITUDINAL THERMAL EXPANSION AMONG BOLT MATERIAL, CERAMIC, AND THE ALUMINUM. THE HIGHLY INSULATING SECTION BETWEEN CAP AND BODY IS A UNIQUE FEATURE, CONSISTING OF A STACK OF THIN METAL DISCS WITH HIGH SURFACE ROUGHNESS. EACH LAYER PROVIDES A THERMAL CONTACT RESISTANCE, COMPRISING A SIGNIFICANT THERMAL BARRIER. THE STACKED DISC DESIGN IS FLEXIBLE, SINCE IT WILL NOT DEVELOP THERMAL STRESS DUE TO AXIAL THERMAL GRADIENTS IN THE PISTON. THE PISTON IS OF A CROSSHEAD DESIGN, WITH A SEPARATE SKIRT. THIS SIMPLY SUPPORTS THE CERAMIC CAP (CROWN) WITH AN AXISYMMETRIC SHAPE. THE SKIRT'S SEPARATE NATURE PREVENTS IT FROM CARRYING THE CYLINDER GAS LOAD WITH TOO LARGE A DIAMETER SUPPORT; OTHER ADVANTAGES INCLUDE GREATER FLEXIBILITY IN PROTOTYPE APPLICATION, LESS LATERAL MOTION OF THE RING GROOVES, AND LESS LATERAL MOTION OF THE PISTON CROWN, 13 MM TALLER THAN THE CONVENTIONAL CUMMINS NTC-350 PISTON. PROTOTYPE TESTING OF THE ADIABATIC ENGINE PISTON HAS BEGUN, FIRST WITH A STAINLESS STEEL VERSION, FOLLOWED BY THE INCORPORATION OF CERAMICS IN A HOT PRESSED SILICON NITRIDE CAPPED PISTON; PISTON DESIGN USING CERAMICS IS VIABLE, WITH IMPROVEMENTS IN MECHANICAL CLAMPING.

Publ: AUTOMOTIVE ENGINEERING V86 N6 P72-6 (JUN 1978)

BASED ON SAE-780069, "DESIGNING ADIABATIC ENGINE COMPONENTS," BY JOHN H. STANG; PRESENTED AT SAE CONGRESS, DETROIT, 27 FEB-3 MAR.

Availability: SEE PUBLICATION

HS-023 461

## WORLD ENERGY OUTLOOK

THE WORLD ENERGY OUTLOOK IS EXAMINED IN LIGHT OF ASSESSING THE IMPLICATIONS OF THE CHANGING WORLD ENERGY ENVIRONMENT. RESULTS OF THE CURRENT OUTLOOK PROJECTIONS TO 1990 ARE PRESENTED, BASED ON STUDIES COMPLETED AT THE END OF 1977. A GRADUAL REDUCTION IN DEPENDENCE ON OIL FOR GROWTH IN ENERGY SUPPLY IS PREDICTED, WITH WORLD ECONOMIC GROWTH ANTICIPATED TO BE SLOWER IN THE FUTURE THAN IN THE PAST. PROJECTIONS OF ENERGY DEMAND HAVE BEEN MARKED DOWN SUCCESSIVELY IN RECENT YEARS, WHILE GROWTH OF NONPETROLEUM SUPPLIES, PARTICULARLY COAL AND NUCLEAR, IS ACCELERATING. THE NEED CONTINUES, HOWEVER, FOR INCREASING SUPPLIES FROM THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES (OPEC) NATIONS. OPEC'S RESOURCES APPEAR ADEQUATE, BUT THE OIL AVAILABLE WILL DEPEND ON THE POLICIES OF THE PRODUCING-COUNTRY GOVERNMENTS. THE POSSI-

BILITY OF SOME TIGHTENING IN THE WORLD OIL MARKET, LONG TERM, IS SUGGESTED, SINCE OIL DISCOVERIES ARE NOT PROJECTED TO KEEP UP WITH CONSUMPTION; A PLATEAU MAY BE REACHED BEFORE THE TURN OF THE CENTURY. TIMELY DEVELOPMENT OF ALL ECONOMICALLY EFFICIENT SOURCES IS IMPORTANT TO ENSURE THE TRANSITION TO A NEW FUEL SUPPLY PATTERN AT REASONABLE COSTS. GOVERNMENT POLICIES FOSTERING APPROPRIATE MARKET INCENTIVES AS WELL AS THE RESOLUTION OF ENVIRONMENTAL ISSUES ARE CRITICAL.

EXXON CORP., 1251 AVE. OF THE AMERICAS, NEW YORK, N.Y. 10020

1978; 48P

EXXON BACKGROUND SERIES.

Availability: CORPORATE AUTHOR

HS-023 462

## MECHANISMS OF HEAT BUILD-UP FAILURE IN TYRES [TIRES]

THE NATURE AND CAUSES OF HEAT BUILD-UP FAILURE IN LARGE TIRES WERE STUDIED, USING BOTH PNEUMATIC TIRES (SIZE 10.00 - 20 TRUCK TIRES) AND LARGE SOLID TIRES, SUCH AS THOSE USED ON TRACK-LAYING VEHICLES. TIRE BEHAVIOR WAS CLOSELY INVESTIGATED DURING RIG TESTS UNDER CONTROLLED CONDITIONS THAT LEAD TO FAILURE. PARALLEL LABORATORY WORK EXAMINED THE PROPERTIES OF THE RUBBERS USED IN TIRES, BOTH AFTER NORMAL VULCANIZATION AND AFTER AGING UNDER APPROPRIATE CONDITIONS. RESULTS INDICATE THAT FAILURE IN TRUCK TIRES, WHICH ULTIMATELY INVOLVES TREAD LIFT AND/OR BLOW-OUT, IS PRECEDED BY THE DEVELOPMENT OF A CRACK THAT PROPAGATES, AT FIRST SLOWLY BUT FINALLY VERY RAPIDLY, AROUND A TIRE IN THE OUTER PLY REGION. THUS NOT ONLY THE THERMAL RESISTANCE BUT ALSO THE HIGH-TEMPERATURE STRENGTH PROPERTIES OF THE RUBBER ARE LIKELY TO BE IMPORTANT; FATIGUE RESISTANCE AT HIGH TEMPERATURES CAN BE MARKEDLY REDUCED BY AGING UNDER CONDITIONS SIMILAR TO THOSE FOUND IN A TIRE. A DIFFERENT MECHANISM IS BELIEVED TO OPERATE FOR SOLID TIRES, WHERE FAILURE APPEARS TO RESULT FROM A "THERMAL RUNAWAY" PROCESS IN WHICH HIGH-TEMPERATURE DETERIORATION OF THE RUBBER LEADS TO PROGRESSIVELY INCREASED HEAT GENERATION, HIGHER TEMPERATURES, AND FASTER RATES OF DETERIORATION; THE THERMAL RESISTANCE OF THE RUBBER IS THEREFORE THE MOST SIGNIFICANT PROPERTY FOR SOLID TIRES.

by R. D. V. BENNETT; H. CEATO; G. J. LAKE; R. M. ROLLASON; G. A. PITTMAN  
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MALAYSIAN RUBBER PRODUCERS' RES. ASSOC.,  
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HS-023 463

# **FRICION AND WEAR PROPERTIES OF TYRES [TIRES]**

A DETAILED EXAMINATION IS MADE OF THE RUBBER PROPERTIES WHICH ARE IMPORTANT IN ACHIEVING MAXIMUM GRIP ON DIFFERENT SURFACES IN VARIOUS WEATHER CONDITIONS. RUBBERS WITH HIGHER HYSTERESIS HAVE HIGHER FRICTION ON WET SURFACES, BUT ALSO GENERATE MORE HEAT AND THEREFORE CANNOT BE USED ON LARGE TIRES. THE USE OF OIL EXTENDED NATURAL RUBBER HAS OVERCOME THE WET GRIP PROBLEM WHILE RETAINING BETTER PERFORMANCE ON ICE THAN CURRENT SYNTHETIC TREADS. THE FRICTION OF NATURAL RUBBER (NR) IS HIGHER THAN THAT OF STYRENE BUTADIENE RUBBER (SBR). A LABORATORY PENDULUM SKID TESTER PERMITS BOTH THE ASSESSMENT OF DIFFERENT ROAD SURFACES WITH A STANDARD RUBBER AND EVALUATION OF VARIOUS RUBBER COMPOUNDS ON A PARTICULAR SURFACE. WEAR BEHAVIOR IS INFLUENCED BY TEMPERATURE; NR IS BETTER AT LOW TEMPERATURES, SBR AT HIGHER. METHODS OF TESTING TIRE WEAR ARE COMPARED; THE USE OF A TEST-TRAILER IS DESCRIBED, WITH THE WHEELS INCLINED IN THE DIRECTION OF TRAVEL SO THAT IN EFFECT EACH WHEEL IS CORNERING, INCREASING THE RATE OF WEAR ON THE TIRES. LABORATORY MACHINES FOR EVALUATING THE ABRASION RESISTANCE OF RUBBER ARE GENERALLY UNSATISFACTORY; THE AKRON ABRASION MACHINE IS USED EXTENSIVELY, BUT THE REPRODUCIBILITY OF THE TESTS IS POOR. HOWEVER, THIS MACHINE ESTABLISHED THE EFFECT OF ANTIOXIDANTS IMPROVING THE ABRASION RESISTANCE OF NR. WORK IS BEING CARRIED ON WITH AN ATTEMPT TO RELATE IN A QUANTITATIVE WAY THE ABRASION OF RUBBER BY A LINE CONTACT, IN PRACTICE, A RAZOR BLADE, TO THE CRACK GROWTH PROPERTIES OF THE RUBBER. RECENT NEW DEVELOPMENTS INCLUDE RUN-FLAT TIRES ALLOWING NORMAL DRIVING CONTROL TO BE MAINTAINED IN THE EVENT OF A SUDDEN DEFLATION; THE CAST TIRE DEVELOPED BY FIRESTONE; THE PIRELLI TIRE WITH THICK SIDEWALLS AND A RUN-FLAT CAPABILITY; A NEW TIRE CORD, KEVLAR, BY DUPONT; AND TYRE RUBBER, A FORM OF NATURAL RUBBER WITH ADVANTAGES IN STORING AND PROCESSING, RESISTANCE TO "FREEZING," LOWER HEAT BUILD-UP, IMPROVED TREAD WEAR AND RESISTANCE TO GROOVE CRACKING. WITH A CLEARER UNDERSTANDING AT PRESENT OF THE FACTORS INFLUENCING TIRE FRICTION THAN TIRE ABRASION, MEANINGFUL FRICTION MEASUREMENTS CAN BE MADE IN THE LABORATORY WHEREAS USEFUL ABRASION MEASUREMENTS CANNOT. A

BREAKTHROUGH IS POSSIBLE FROM THE WORK RELATING ABRASION TO FRACTURE MECHANICS.

by E. SOUTHERN

MALAYSIAN RUBBER PRODUCERS' RES. ASSOC., BRICKENDONBURY, ENGLAND

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Availability: MALAYSIAN RUBBER PRODUCERS' RES. ASSOC., BRICKENDONBURY, HERTS. SG13 8NP, ENGLAND

HS-802 377

# **VEHICLE LENGTH RESTRICTIONS. A REPORT TO THE SECRETARY OF TRANSPORTATION**

THE BASIC PRINCIPLE OF LIMITING TRAILER OR CARGO-CARRYING LENGTH OF TRUCKS IN ORDER TO REMOVE A MAJOR ECONOMIC INCENTIVE THAT COULD JEOPARDIZE SAFETY IS DISCUSSED. AS A RESULT OF OVERALL LENGTH LIMITS TRUCKS HAVE BEEN DESIGNED TO MAXIMIZE CARGO-CARRYING CAPACITY, BY REDUCING THE SIZE OF THE OCCUPANT COMPARTMENT, BY DEVELOPING DESIGNS BASED ON CARGO VOLUME CAPACITY WITHOUT APPROPRIATE EMPHASIS ON SAFETY (THE PROPOSED "CAB-UNDER" TRAILER), AND BY INCREASING USE OF THE CAB-OVER-ENGINE DESIGN. ESTABLISHING A LENGTH LIMIT THAT EXCLUDES THE TRACTOR OR TRUCK CAB WOULD ELIMINATE THE ECONOMIC INCENTIVE FOR CONSTRUCTING SHORTER CABS, VEHICLES WITH RESTRICTED BUMPER-TO-BACK-OF-CAB (BBC) DIMENSIONS. FREEDOM TO INCREASE BBC DIMENSIONS WOULD IMPROVE DRIVER COMFORT AND SAFETY, IMPROVE INGRESS AND EGRESS TO THE CAB, PROVIDE A WIDER BERTH IN CABS WITH SLEEPING COMPARTMENTS, IMPROVE ACCESSIBILITY TO THE ENGINE FOR INSPECTION OR MAINTENANCE, IMPROVE AERODYNAMICS (SINCE EXTERIOR SHAPE COULD BE REVISED), AND AVOID SHORT WHEELBASES AND HIGH FIFTH WHEEL OFFSETS. OVERALL LENGTH HAS IMPORTANT SAFETY IMPLICATIONS WITH REGARD TO TURNS, PASSING, LANE CHANGES, AND CURVED RAMPS, AND OVERALL LENGTH LIMITS SHOULD NOT BE ABANDONED. IT IS RECOMMENDED THAT INPUT FROM THE STATES BE SOUGHT TO DEVELOP MODEL LENGTH LIMITS THAT DO NOT PROVIDE AN ECONOMIC INCENTIVE TO INCREASE CARGO SPACE AT THE EXPENSE OF TRACTOR LENGTH. IN ADDITION, THE DEPT. OF TRANSPORTATION SHOULD RECOMMEND TO THE STATES THAT THEY ESTABLISH LENGTH REGULATIONS SPECIFICALLY LIMITING THE LENGTH OF TRAILERS (OR THE CARGO CARRYING PORTION) RATHER THAN MERELY SETTING A SINGLE OVERALL LENGTH LIMIT. ADDITIONAL LIMITS ON OVERALL LENGTH MAY BE APPROPRIATE BUT THE PRIMARY OBJECTIVE SHOULD BE TO REDUCE THE POSSIBILITY



THAT NONCARGO-CARRYING LENGTH WOULD BE DECREASED AT THE EXPENSE OF SAFETY.

by SUSAN P. BAKER  
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SUBCOMMITTEE, WASHINGTON, D.C. 20590  
1977; 14P 9REFS  
Availability: CORPORATE AUTHOR

HS-802 379

**CRASH TESTING OF EXPERIMENTAL SAFETY VEHICLES. VOL. 1: BRITISH LEYLAND MARINA SAFETY RESEARCH VEHICLE. FINAL REPORT**

TO EVALUATE THE CRASHWORTHINESS AND OCCUPANT PROTECTION PERFORMANCE OF BRITISH LEYLAND'S PHASE 1 MARINA SAFETY RESEARCH VEHICLE (SRV), VEHICLE AND DUMMY OCCUPANT RESPONSES WERE MEASURED IN TWO CRASH TESTS: ONE A CENTRAL HEAD-ON IMPACT OF A FOUR-DOOR MARINA SRV WITH AN AMF EXPERIMENTAL SAFETY VEHICLE (ESV) AT A NOMINAL CLOSING SPEED OF 60 MPH, AND THE OTHER, A 90° 30 MPH SIDE IMPACT OF A TWO-DOOR MARINA SRV BY A MODIFIED STANDARD MARINA AUTOMOBILE. THE MARINA SRV IS A FOUR-PASSENGER, INTERMEDIATE SIZE VEHICLE IN THE 2500-3000 LB WEIGHT CLASS, WITH FRONT ENGINE, REAR-WHEEL DRIVE, A 96-INCH WHEELBASE AND OVERALL LENGTH OF 175.5 INCHES FOR THE FOUR-DOOR MODEL (172.5 INCHES FOR THE TWO-DOOR MODEL). IN THE TEST WITH THE HEAVIER AMF ESV, THE MARINA SRV FRONTAL STRUCTURE COLLAPSED 26.5 INCHES, BUT THE INTRUSION OF THE PASSENGER COMPARTMENT WAS MINOR. ALL GLASS REMAINED INTACT AND ALL DOORS WERE EASILY OPENED AFTER THE CRASH. THE ENERGY ABSORBED IN STROKING OF THE AMF HYDRAULIC BUMPER SYSTEM HELPED TO REDUCE THE IMPACT'S SEVERITY. THE RESULTS FOR BOTH DUMMIES WERE WELL WITHIN THE ENGLISH AND U.S. INJURY CRITERIA, INDICATING THAT HUMAN OCCUPANTS PROBABLY WOULD NOT HAVE BEEN SERIOUSLY INJURED. IN THE SIDE IMPACT TEST, THE PASSENGER COMPARTMENT OF THE MARINA SRV WAS INTRUDED NEARLY FOUR INCHES ON THE STRUCK SIDE, AND THE DOOR COULD NOT BE OPENED. THE RIGHT DOOR WAS UNDAMAGED; GLAZING REMAINED INTACT; THERE WAS NO FUEL LEAKAGE. DUMMY RESPONSE MET ALL U.S. AND ENGLISH INJURY CRITERIA REQUIREMENTS EXCEPT FOR THE PEAK FORCE ON ONE OF THE RIBS OF THE SPECIAL ENGLISH SIDE-IMPACT DUMMY WHICH SLIGHTLY EXCEEDED THE RECOMMENDED MAXIMUM LOAD. HUMAN OCCUPANTS WOULD HAVE SURVIVED WITHOUT SERIOUS INJURIES. THE CRASHWORTHINESS PERFORMANCE OF THE STRUCTURAL AND OCCUPANT PROTECTION SYSTEMS WAS ADEQUATE FOR THE IMPACT CONDITIONS SELECTED FOR THE EVALUATION. THE TESTS CONFIRMED THE ACHIEVEMENT OF SAFETY PERFORMANCE OBJECTIVES SPECIFIED FOR THE SRV PROGRAM THAT HAD ALREADY BEEN DEMONSTRATED IN TESTS OF EQUAL TO, OR, IN THE CASE OF FRONTAL IMPACTS, GREATER SEVERITY BY THE MANUFACTURER. THE IMPACT WITH THE AMF ESV WAS USEFUL IN DEMONSTRATING FURTHER THE CAR-TO-CAR FRON-

TAL CRASH PERFORMANCE OF THE SRV EQUIPPED WITH A NEW, EXPERIMENTAL BELT RESTRAINT SYSTEM, AND WITH DUMMIES OF A DIFFERENT TYPE THAN HAD BEEN USED IN DEVELOPMENTAL TESTS. THE LOSS OF DATA WAS AVOIDED BY REDUNDANT RECORDING OF DATA ON DIFFERENT MAGNETIC TAPE RECORDERS. APPENDED ARE THE AMV ESV/MARINA 1 SRV FRONTAL IMPACT AND MARINA 2/MARINA 3 SRV SIDE IMPACT TEST DATA PLOTS.

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Availability: NTIS

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**CRASH TESTING OF EXPERIMENTAL SAFETY VEHICLES. VOL. 2: RENAULT BASIC RESEARCH VEHICLE**

TO EVALUATE THE CRASHWORTHINESS AND OCCUPANT PROTECTION PERFORMANCE OF THE FRENCH RENAULT BASIC RESEARCH VEHICLE (BRV), VEHICLE AND DUMMY OCCUPANT RESPONSES WERE MEASURED IN TWO CRASH TESTS: ONE, A LEFT FRONT OBLIQUE IMPACT TEST WITH A RIGID 30° ANGLED BARRIER AT A SPEED OF 42.5 MPH, AND THE OTHER A 75° RIGHT SIDE IMPACT OF THE STATIONARY BRV BY THE FRONT OF A STANDARD PRODUCTION RENAULT R-12 AUTOMOBILE AT A SPEED OF 31.3 MPH. THE RENAULT BRV IS A FIVE-PASSENGER INTERMEDIATE SIZE SEDAN OF THE 2500-3000 LB WEIGHT CLASS, WITH FRONT ENGINE, FRONT WHEEL DRIVE, A 103 INCH WHEELBASE, AND OVERALL LENGTH OF 174.5 INCHES. IN THE OBLIQUE TEST, ALTHOUGH VEHICLE FRONT END DAMAGE WAS EXTENSIVE, THE PASSENGER COMPARTMENT REMAINED INTACT AND THE 4.5 INCH INTRUSION IN THE AREA OF THE TOEBOARD WAS NOT DEEMED A SERIOUS HAZARD TO FRONT SEAT OCCUPANTS. THE WINDSHIELD WAS CRACKED, BUT REMAINED IN PLACE; ALL OTHER GLAZING WAS INTACT. REAR DOORS COULD BE OPENED EASILY, BUT FRONT DOORS WERE JAMMED, THUS HINDERING EGRESS OR RESCUE. THE SAFETY RESTRAINTS ADEQUATELY PROTECTED THE OCCUPANTS; ALL VALUES FOR BOTH DUMMIES WERE WELL WITHIN FRENCH AND U.S. INJURY CRITERIA SPECIFICATIONS. IN THE SIDE IMPACT TEST, PASSENGER COMPARTMENT INTRUSION WAS LESS THAN 2.5 INCHES. ALTHOUGH THE STRUCK SIDE DOORS WERE JAMMED SHUT, THE DOORS ON THE OPPOSITE SIDE OPENED EASILY. THERE WAS NO FUEL LEAKAGE; GLAZING REMAINED INTACT. THE RESPONSES OF BOTH DUMMIES MET ALL U.S. AND FRENCH INJURY CRITERIA. THE SIDE INTERIOR PADDING PROVED EFFECTIVE IN PROTECTING THE FRONT SEAT OCCUPANTS SINCE THERE WERE LARGE DIFFERENCES BETWEEN THE HEAD AND CHEST DATA OF THE TWO DUMMIES. THE CRASHWORTHINESS PERFORMANCE OF THE STRUCTURAL AND OCCUPANT PROTECTION SYSTEMS WAS ADEQUATE FOR THE IMPACT CONDITIONS SELECTED. THE TESTS CONFIRMED TH

December 31, 1978

HS-802 515

ACHIEVEMENT OF SAFETY PERFORMANCE OBJECTIVES OF THE BRV DEVELOPMENT PROGRAM. THE SEVERITY OF THE ANGLED BARRIER TEST WAS CLOSE TO THE BRV DESIGN SAFETY PERFORMANCE LIMIT. RESULTS FROM THE SIDE IMPACT TEST INDICATE THAT THE BRV IS CAPABLE OF PROTECTING THE OCCUPANTS IN CRASHES OF SOMEWHAT GREATER SEVERITY THAN THAT CORRESPONDING TO THE MASS AND AGGRESSIVITY OF THE PRODUCTION R-12 AUTOMOBILE IMPACTING AT 31.3 MPH. NO DATA OF MAJOR SIGNIFICANCE WERE LOST, DUE TO THE REDUNDANT RECORDING OF DATA ON DIFFERENT MAGNETIC TAPE RECORDERS. APPENDED ARE DATA PLOTS FOR THE RENAULT BRV ANGLED BARRIER IMPACT AND THE RENAULT R-12/RENAULT BRV FRONT-TO-SIDE IMPACT TESTS.

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HS-802 405

**PROGRAM EVALUATION SUPPORT FOR THE  
MOTOR VEHICLE DIAGNOSTIC INSPECTION  
DEMONSTRATION PROJECTS. VOL 1: USED CAR  
OWNER SURVEY. FINAL REPORT**

AN ANALYSIS WAS MADE OF 1309 USED-CAR OWNER SURVEY QUESTIONNAIRES VOLUNTARILY SUBMITTED BY NEW MOTOR VEHICLE DIAGNOSTIC PROGRAM PARTICIPANTS IN ARIZONA, ALABAMA, AND TENNESSEE IN THE FIRST QUARTER OF 1976, IN ORDER TO ASCERTAIN THE INCIDENCE AND FREQUENCY OF SAFETY CRITICAL AND OTHER DEFECTS IN USED CARS, AND TO COMPARE THE FREQUENCY AND CATEGORY OF DEFECTS IN USED CARS TO SIMILAR MAKE/MODEL/YEAR OF MANUFACTURE VEHICLES IN THE GENERAL AUTOMOBILE POPULATION. DIFFERENCES IN THE INCIDENCE OF REJECTS BETWEEN VEHICLES PURCHASED USED FROM DEALERS AND THE GENERAL VEHICLE POPULATION WERE IDENTIFIED BY INVESTIGATING THE RECORDS OF VEHICLES ENROLLED IN THE DIAGNOSTIC PROGRAM. IT WAS FOUND THAT MOST VEHICLES (MODEL YEARS 1968-1973) GIVEN THOROUGH SAFETY AND EMISSIONS INSPECTIONS FAILED AT LEAST ONE INSPECTION ITEM; THAT USED CARS PURCHASED FROM DEALERS TENDED TO HAVE A HIGHER NUMBER OF DEFECTS COMPARED WITH THE GENERAL POPULATION; THAT OLDER CARS PURCHASED NEW AND RETAINED BY OWNERS HAVE FEWER DEFECTS THAN CARS IN THE GENERAL VEHICLE POPULATION; AND THAT USED CARS PURCHASED FROM DEALERS EXHIBITED HIGHER ODOMETER READINGS THAN SIMILAR AGE VEHICLES IN THE GENERAL POPULATION. THE INSPECTIONS CONDUCTED IN THE DIAGNOSTIC DEMONSTRATION PROGRAM WERE ONLY FOR SAFETY AND EMISSIONS, AND DID NOT INCLUDE INSPECTIONS OF NONSAFETY-RELATED FUNCTIONAL COMPONENTS, SUCH AS ENGINE, CLUTCH, AUTOMATIC OR MANUAL TRANSMISSION, DRIVE TRAIN, REAR AXLE, ETC. HOWEVER, THE SAFETY AND EMISSIONS

SUBSYSTEMS COMPRISE MOST OF THE AUTOMOBILE'S COMPONENTS, AND LIKELY ARE REPRESENTATIVE OF THE VEHICLE'S CONDITION. APPENDED ARE A COPY OF THE USED-CAR OWNER'S SURVEY FORM, A COMPARISON OF OUTAGE RATES FOR USED AND NEW VEHICLES FOR EACH OF THE THREE STATES, AND FAILURE RATES FOR THE FIRST PERIODIC INSPECTION POPULATION BY SUBSYSTEM FOR EACH OF THE THREE STATES.

by J. DUDA; V. SELMAN; K. DERR  
COMPUTER SCIENCES CORP., 6565 ARLINGTON  
BLVD., FALLS CHURCH, VA. 22046  
DOT-HS-5-01036  
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Availability: NTIS

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**AN EXAMINATION OF TORT LIABILITY ISSUES  
CONNECTED WITH RELEASE OF ARRESTED,  
INTOXICATED DWI [DRIVING WHILE  
INTOXICATED] OFFENDERS. FINAL REPORT**

THE LEGAL ISSUES CONCERNING A NONJAIL OPTION FOR DRINKING WHILE INTOXICATED (DWI) OFFENDERS ARE STUDIED AND THE RISKS SUCH PROCEDURES HAVE FOR ENFORCEMENT AGENCIES ARE EXPLORED. THE REPORT EXAMINES THE TORT LIABILITY OF SUCH AGENCIES IF A RELEASED OFFENDER CRASHES AN AUTOMOBILE AND INJURES HIMSELF/HERSELF OR ANOTHER, WHILE STILL INTOXICATED FROM THE ORIGINAL DRINKING EPISODE. THE REPORT IS DIVIDED INTO FOUR PARTS: ANALYSIS OF ELEMENTS OF A TORT CAUSE OF ACTION; ANALYSIS OF REPORTED CASES DIRECTLY ON POINT; ANALYSIS OF CASES ARISING OUT OF TRADITIONAL ENFORCEMENT PROCEDURE; AND DISCUSSION OF ISSUES AND FINDINGS. A SURVEY OF 200 MUNICIPAL LAW ENFORCEMENT AGENCIES IS DESCRIBED AND EXTENSIVE CASE CITATIONS ARE GIVEN. A SAMPLE OF THE SURVEY FORM AND SAMPLES OF ILLUSTRATIVE STATE STATUTES ARE APPENDED.

by JOSEPH W. LITTLE; MIKE COOPER  
NATIONAL SAFETY COUNCIL, 444 N. MICHIGAN AVE.,  
CHICAGO, ILL. 60611  
DOT-HS-4-00965  
1977; 85P  
REPT. FOR JUN 1975-JUN 1976.  
Availability: NTIS

HS-802 515

**A MANUAL FOR MANAGING COMMUNITY  
ALCOHOL SAFETY EDUCATION CAMPAIGNS**

A GUIDE FOR ESTABLISHING SYSTEMATIC PROGRAMS THAT RESPOND TO THE ALCOHOL SAFETY EDUCATION NEEDS OF INDIVIDUAL COMMUNITIES IS PRESENTED. CHAPTERS DISCUSS THE FOLLOWING ASPECTS OF SUCH PUBLIC INFORMATION CAMPAIGNS: THE AUTOMOBILE AND ALCOHOL IN DAILY LIFE, DEVELOPING A COMMUNICATIONS PLAN, DEFINING OBJECTIVES, IDENTIFYING TARGET AU-

HS-802 525

DIENCES, COMMUNITY SUPPORT, WHAT DOES A COMMUNITY KNOW ABOUT DRUNK DRIVING, CARRYING OUT A CAMPAIGN THAT WORKS, WORKING THE MEDIA/PERSON-TO-PERSON PRESENTATIONS, AND MANAGING THE CAMPAIGN. APPENDED ARE CAPSULE COMMUNICATIONS PLANS FOR TARGET AUDIENCES, AND A SAMPLE TELEPHONE QUESTIONNAIRE CONCERNING DRUNK DRIVING. A BIBLIOGRAPHY AND OTHER SUGGESTED RESOURCES ARE PROVIDED.

NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, OFFICE OF DRIVER AND  
PEDESTRIAN PROGRAMS, WASHINGTON, D.C. 20590  
1978; 54P 33REFS  
Availability: CORPORATE AUTHOR

HS-802 525

**THE EVALUATION OF HIGHWAY TRAFFIC  
SAFETY PROGRAMS. A MANUAL FOR MANAGERS.  
REV. ED. 1977**

THE MANUAL DESCRIBES IN NONTECHNICAL TERMS THE CONCEPTS, METHODS, AND TECHNIQUES OF EVALUATION; DEMONSTRATES STEP BY STEP PROCEDURES FOR CONDUCTING EVALUATIONS OF HIGHWAY TRAFFIC SAFETY PROJECTS; AND SUGGESTS WAYS OF ORGANIZING AND MANAGING A HIGHWAY TRAFFIC SAFETY PROJECT EVALUATION. TEN STEPS IN THE EVALUATION PROCESS ARE DETAILED: SELECTION OF PROJECTS, DEFINITION OF PURPOSES AND LIMITATIONS, DEFINITION OF PROJECT OBJECTIVES AND EVALUATION CRITERIA, DESIGN OF THE STUDY, DESIGN OF THE DATA ANALYSIS SYSTEM, COLLECTION OF THE DATA, PRESENTATION AND ANALYSIS OF THE DATA, DETERMINATION OF THE FINDINGS AND PRODUCTION OF THE REPORT, INTEGRATION OF THE EVALUATION RESULTS WITH PLANNING AND MANAGEMENT SYSTEMS, AND REVIEW AND REVISION OF EVALUATION NEEDS AND PROCEDURES. AN OUTLINE OF THE TASKS AND ACTIVITIES IN THE EVALUATION PROCESS IS GIVEN. CASE ILLUSTRATIONS ARE PROVIDED FOR DEVELOPING A BASE FOR ORGANIZING AND MANAGING EVALUATION, TRAINING TRAFFIC RECORDS PERSONNEL, CONDUCTING A PEDESTRIAN SAFETY STUDY AND A DRIVER REWARD PROJECT, DETERMINING THE EFFECTS OF ENFORCEMENT ON DRIVING SPEED AND ON TRAFFIC FLOW BEHAVIOR, IMPLEMENTING A RANDOM CHECKLANE PROCEDURE FOR MOTOR VEHICLE INSPECTION, CONDUCTING A COST-EFFECTIVENESS ANALYSIS OF TWO ALCOHOL SAFETY PROJECTS, AND EVALUATING A ROADWAY REDESIGN PROJECT. APPENDICES COVER SUCH TOPICS AS SELECTED SURVEY TECHNIQUES AND CONSIDERATIONS, CHARTS FOR DETERMINING SAMPLE SIZE AND HOW TO USE THEM, COMPUTATIONAL PROCEDURES, EVALUATION PROBLEMS BY PROJECT PHASE, SELECTED STATISTICAL PROCEDURES FOR ANALY-

HSL 78-

SIS OF COUNTERMEASURE DATA, AND DEFINING PROJECT OBJECTIVES.

by WILLIAM E. TARRANTS, ED.; C. HARDING VEIGE  
ED.  
NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, MANPOWER DEVEL. DIV.,  
WASHINGTON, D.C. 20590  
1977; 261P 87REFS  
Availability: GPO

HS-803 070

**INSERVICE TRAINING SEMINAR FOR THE DRIVER  
LICENSING ADMINISTRATIVE HEARING OFFICER  
PARTICIPANT'S MANUAL**

THIS MANUAL IS PART OF A TWO-DAY TRAINING PACKAGE FOR THE PARTICIPANT IN A SEMINAR CONDUCTED BY A DRIVER LICENSING ADMINISTRATIVE HEARING OFFICER, A PERSON AUTHORIZED TO HEAR AND/OR ADJUDICATE MOTOR VEHICLE LICENSING AGENCY CASES IN WHICH DISCRETIONARY LICENSE ACTIONS ARE TAKEN, DESIGNED BY THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION IN ORDER TO EDUCATE DRIVERS IN TRAFFIC SAFETY AND IMPART A RESPECT FOR LAW ENFORCEMENT AGENCIES. THE MANUAL INCLUDES SEMINAR AGENDA, LIST OF HANDOUTS, AND TENS OF UNITS OF INSTRUCTION, COVERING THE HIGHWAY SAFETY SYSTEM, LICENSING AGENCY RESEARCH REVIEW, LEGAL ASPECTS: HEARING CONDUCTION, SANCTION DECISION, PRACTICAL APPLICATION OF LEGAL REQUIREMENTS, PUBLIC SAFETY: DRIVER PROBLEM IDENTIFICATION, INTERPERSONAL DYNAMICS, PRACTICAL APPLICATION: THE HEARING PROCESS, AND COURSE SUMMARY. ADDITIONAL SCORING KEYS ARE APPENDED.

NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, WASHINGTON, D.C. 20590  
1978; 77P  
CLEARINGHOUSE TRAINING MATERIALS. SUBJECT: DRIVER LICENSING ADMINISTRATIVE HEARING OFFICERS' TRAINING\*. FORMAT: PARTICIPANT'S MANUAL. TYPE OF AUDIENCE: DRIVER LICENSING ADMINISTRATIVE HEARING OFFICER\*. INSTRUCTOR'S MANUAL IS HS-803 072; ADMINISTRATOR'S GUIDE IS HS-803 071.  
Availability: GPO, STOCK NO. 050-003-00310-7

HS-803 072

**INSERVICE TRAINING SEMINAR FOR THE DRIVER  
LICENSING ADMINISTRATIVE HEARING OFFICER  
INSTRUCTOR'S MANUAL**

THIS MANUAL IS PART OF A TWO-DAY TRAINING PACKAGE FOR THE DRIVER LICENSING ADMINISTRATIVE HEARING OFFICER, THE PERSON AUTHORIZED TO HEAR AND/OR ADJUDICATE MOTOR VEHICLE LICENSING AGENCY CASES IN WHICH DISCRETIONARY LICENSE ACTIONS ARE TAKEN, DESIGNED BY THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION IN ORDER TO EDUCATE DRIVERS IN TRAFFIC SAFETY AND IMPART RESPECT FOR LAW ENFORCEMENT AGENCIES. THE MANUAL INCLUDES SEMINAR AGENDA, LIST OF HANDOUTS, AND TENS OF UNITS OF INSTRUCTION, COVERING THE HIGHWAY SAFETY SYSTEM, LICENSING AGENCY RESEARCH REVIEW, LEGAL ASPECTS: HEARING CONDUCTION, SANCTION DECISION, PRACTICAL APPLICATION OF LEGAL REQUIREMENTS, PUBLIC SAFETY: DRIVER PROBLEM IDENTIFICATION, INTERPERSONAL DYNAMICS, PRACTICAL APPLICATION: THE HEARING PROCESS, AND COURSE SUMMARY. ADDITIONAL SCORING KEYS ARE APPENDED.

ASPECTS OF THE HEARING OFFICER'S JOB ARE EMPHASIZED. THE MANUAL INCLUDES A SEMINAR AGENDA, LIST OF HANDOUTS, INSTRUCTOR'S GUIDELINES (QUALIFICATIONS, DUTIES AND RESPONSIBILITIES, INSTRUCTIONAL METHODS AND USE OF MANUALS AND LECTURE OUTLINES), AND TEN UNITS OF INSTRUCTION, COVERING: THE HIGHWAY SAFETY SYSTEM; LICENSING AGENCY RESEARCH REVIEW; LEGAL ASPECTS - HEARING CONDUCT; SANCTION DECISION; PRACTICAL APPLICATION - LEGAL REQUIREMENTS; PUBLIC SAFETY - DRIVER PROBLEM IDENTIFICATION; INTERPERSONAL DYNAMICS; PRACTICAL APPLICATION - THE HEARING PROCESS; AND COURSE SUMMARY. INSTRUCTIONS FOR USE OF AUDIOTAPES AND REFERENCES ARE INCLUDED IN APPENDICES.

NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION, WASHINGTON, D.C. 20590  
1978; 108P 22REFS  
CLEARINGHOUSE TRAINING MATERIALS. SUBJECT: DRIVER LICENSING ADMINISTRATIVE HEARING OFFICER'S TRAINING\*. FORMAT: INSTRUCTOR'S MANUAL. TYPE OF AUDIENCE: DRIVER LICENSING ADMINISTRATIVE HEARING OFFICER\*. PARTICIPANT'S MANUAL IS HS-803 070. ADMINISTRATOR'S GUIDE IS HS-803 071.  
Availability: GPO, STOCK NO. 050-003-00308-5

HS-803 242

**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (5TH) PROCEEDINGS. JULY 11-13, 1977, CAMBRIDGE, MASSACHUSETTS**

THIS COMPILATION OF PAPERS CONCERNS VARIOUS ASPECTS OF MOTOR VEHICLE GOALS BEYOND 1980, THE SUBJECT OF TWO REPORTS (1976) PREPARED BY AN INTERAGENCY FEDERAL TASK FORCE. AN OPENING PLENARY SESSION INCLUDED FOUR PRESENTATIONS ON THE THEME OF THE MEETING, ONE EACH FROM THE VIEWPOINT OF THE COMMERCIAL USER, THE CONSUMER, THE INDUSTRY, AND SOCIETY. SESSION 1 OF THE MEETING ADDRESSED THE SUBJECT OF DESIGNING POST-1980 VEHICLES TO MEET NATIONAL GOALS OF SAFETY, ENERGY CONSERVATION, ENVIRONMENTAL PROTECTION, ECONOMIC GROWTH, AND CONSUMER SATISFACTION; IT WAS COMPRISED OF TWO CONCURRENT SESSIONS, ONE DISCUSSING PASSENGER VEHICLES, THE OTHER, COMMERCIAL VEHICLES. SESSION 2 WAS COMPRISED OF THREE CONCURRENT SESSIONS, EACH ADDRESSING ONE ASPECT OF THE GENERAL TOPIC OF ON-THE-SHELF PROSPECTIVE MATERIAL ON TECHNICAL BREAKTHROUGHS THAT CAN AID IN MEETING POST-1980 VEHICLES (MATERIALS, TRADE-OFF ANALYSIS, AND VEHICLE DIAGNOSTICS AND SERVICES). THE TOPIC OF SESSION 3 WAS TRADE-OFFS BETWEEN VEHICLE DESIGN, SAFETY, AND OTHER NATIONAL GOALS AND WAS COMPRISED OF TWO CONCURRENT SESSIONS (TRADE-OFF ANALYSIS AND VEHICLE PERFORMANCE). THE MEETING CLOSED WITH A PLENARY SESSION COMPRISED OF A PANEL DISCUSSION ON REGULATORY PROCESSES

IN RELATION TO ACHIEVING MOTOR VEHICLE GOALS BEYOND 1980.

NATIONAL MOTOR VEHICLE SAFETY ADVISORY COUNCIL, WASHINGTON, D.C.  
1978; 924P REFS  
INCLUDES HS-021 534--HS-021 566, HS-022 924, AND HS-023 376--HS-023 394.  
Availability: NHTSA

HS-803 243

**STANDARDS ENFORCEMENT TEST REPORTS INDEX FOR 1977. VOL. 1, VOL. 2, VOL. 3**

AN INDEX TO STANDARDS ENFORCEMENT TEST REPORTS FOR THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION, RELEASED TO THE PUBLIC DURING 1977, IS PRESENTED. THE INDEX IS THE NINTH IN A SERIES, THE FIRST INDEX COVERING THE YEAR 1969. THE INDEX IS DIVIDED INTO ELEVEN SECTIONS: MANUFACTURER, MODEL YEAR, MODEL OR PART NUMBER IN VOLUME ONE; FAIL, FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) NUMBER, COMPONENT OR VEHICLE ID, AND LABORATORY TEST NUMBER IN VOLUME TWO; AND CIR NUMBER, HS NUMBER, BRAND OR SELLER AND TIRE SIZE OR BODY STYLE IN VOLUME THREE. ENTRIES ARE ARRANGED ALPHABETICALLY OR NUMERICALLY WITHIN EACH SECTION. A LIST OF STANDARDS TESTED AND TESTING LABORATORIES IS INCLUDED IN VOLUME ONE.

KAPPA SYSTEMS, INC., 1501 WILSON BLVD., ARLINGTON, VA. 22209  
NHTSA-7-3332  
1978; 1680P  
Availability: NTIS

HS-803 259

**HEAVY TRUCKS. FATAL ACCIDENT REPORTING SYSTEM SPECIAL REPORT**

STATISTICAL INFORMATION ON HEAVY TRUCK INVOLVEMENT IN FATAL ACCIDENTS, BASED ON DATA FROM THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION'S (NHTSA) FATAL ACCIDENT REPORTING SYSTEM (FARS) ON SELECTED FEATURES OF THESE ACCIDENTS IN 1975 AND 1976, IS PRESENTED. IN 1976, OVER 4000 PEOPLE WERE KILLED IN THE U.S. IN MOTOR VEHICLE TRAFFIC ACCIDENTS THAT INVOLVED HEAVY TRUCKS. THESE DEATHS ACCOUNTED FOR 8.9% OF ALL TRAFFIC FATALITIES, OR ONE OUT OF EVERY 11 PERSONS KILLED ON THE NATION'S ROADWAYS. FARS REPRESENTS THE MOST COMPREHENSIVE AND DETAILED DATA AVAILABLE ON THE NATIONAL MOTOR VEHICLE FATALITY TOLL, AND PROVIDES, FOR THE FIRST TIME, THE CAPABILITY TO SEPARATE FATAL ACCIDENTS ACCORDING TO THE SIZE OR TYPE OF THE TRUCK INVOLVED. HEAVY TRUCKS REPORTED IN FARS INCLUDE THREE CATEGORIES (SINGLE-UNIT TRUCKS WITH GROSS VEHICLE WEIGHT (GVW) GREATER THAN 26,000 LBS, TWO-UNIT TRUCKS, AND MULTI-UNIT TRUCKS). IN 1976 THERE WAS A 15.7% INCREASE IN FATALITIES

FROM HEAVY TRUCK ACCIDENTS OVER THOSE IN 1975, AND A SIMILAR INCREASE IN TONNAGE CARRIED. HALF THE PEOPLE KILLED IN SUCH ACCIDENTS ARE PASSENGER CAR OCCUPANTS; LESS THAN A QUARTER ARE IN HEAVY TRUCKS. HOURLY ACCIDENT RATES ARE UP TO THREE TIMES HIGHER ON WEEKDAYS THAN ON WEEKENDS; SATURDAYS HAD TWICE THE OCCURRENCE OF ACCIDENTS AS DID SUNDAYS. WHEN HEAVY TRUCKS COLLIDE WITH OTHER VEHICLES, 91% OF THE FATALITIES ARE IN MOTOR VEHICLES OTHER THAN HEAVY TRUCKS. IN FATAL ACCIDENTS INVOLVING ONLY A HEAVY TRUCK AND A PASSENGER CAR, 97% OF THE DEATHS ARE TO CAR OCCUPANTS. A FIRE OR AN EXPLOSION IS MORE PROBABLE IN A HEAVY TRUCK THAN IN OTHER VEHICLES IN ALL FATAL ACCIDENTS.

by MARK E. CASSIDY  
NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, NATIONAL CENTER FOR  
STATISTICS AND ANALYSIS, WASHINGTON, D.C. 20590  
1978; 25P  
Availability: GPO, STOCK NO. 050-003-00313-1

HS-803 280

#### NEAR TERM WEIGHT REDUCTION POTENTIAL IN A 1977 GENERAL MOTORS B BODY VEHICLE. FINAL REPORT

TO ACHIEVE WEIGHT REDUCTION THROUGH LIGHTWEIGHT MATERIAL AND COMPONENT SUBSTITUTIONS IN A 1977 GENERAL MOTORS CORPORATION B BODY VEHICLE, CHANGES WERE MADE WHICH WERE LIMITED TO THOSE THAT APPEARED PRODUCIBLE IN THE 1980 TO 1985 TIME FRAME. THE FIRST PORTION OF THE ANALYSIS INVOLVED GATHERING WEIGHT DATA ON SELECTED COMPONENTS OF A 1975 CHEVROLET IMPALA FOUR-DOOR SEDAN AND A 1977 CHEVROLET IMPALA FOUR-DOOR SEDAN. THE SECOND PORTION OF THE ANALYSIS INVOLVED THE ESTIMATION OF THE POTENTIAL WEIGHT REDUCTIONS POSSIBLE IN THE 1977 IMPALA. THE VEHICLE'S COMPONENTS WERE BROKEN DOWN INTO THE FOLLOWING THREE DIFFERENT, BUT INTERACTIVE CATEGORIES: THE OCCUPANT COMPARTMENT STRUCTURE, THE SUSPENSION/STEERING/BRAKING SYSTEM, AND THE DRIVETRAIN. MATERIAL AND COMPONENT SUBSTITUTIONS WERE CONSERVATIVELY CARRIED OUT SO AS NOT TO AFFECT THE APPEARANCE, SAFETY, OR ACCELERATION PERFORMANCE OF THE VEHICLE. HOWEVER, THE COSTS OF THE CHANGES WERE NOT EXPLICITLY CONSIDERED, AND THEY WOULD BE EXPECTED TO CONTRIBUTE TO SOME INCREASE IN THE REAL PRICE OF THE VEHICLE. THE REDUCTION IN THESE THREE AREAS REDUCED THE CURB WEIGHT OF THE 1977 CHEVROLET IMPALA FOUR-DOOR SEDAN FROM 1682 KG (3708 LB) TO 1429 KG (3150 LB). THUS, A TOTAL WEIGHT REDUCTION OF 250 KG (552 LB) OR 15% RESULTED FROM THIS CONSERVATIVE ANALYSIS OF THE WEIGHT REDUCTION POTEN-

TIAL IN THIS VEHICLE FOR THE 1980 TO 1985 TIME FRAME.

by DONALD A. HURTER; PHILIP G. GOTT; JEFFREY STALEY  
ARTHUR D. LITTLE, INC., ACORN PARK, CAMBRIDGE, MASS. 02140  
DOT-TSC-1047  
Rept. No. DOT-TSC-NHTSA-78-7; 1978; 70P 55REFS  
REPT. FOR JUN 1976-AUG 1977.  
Availability: NTIS

HS-803 289

#### ROADSIDE BARRIER EFFECTIVENESS. NOISE MEASUREMENT PROGRAM. FINAL REPORT

A FIELD NOISE MEASUREMENT PROGRAM WAS CONDUCTED TO ASSESS THE PERFORMANCE OF A VARIABLE HEIGHT HIGHWAY NOISE BARRIER WITH AND WITHOUT AN ACOUSTIC LINING MATERIAL. THE BARRIER SITE ON INTERSTATE I-93 IN ANDOVER, MASS. WAS LOCATED ADJACENT TO AN ACOUSTICALLY SIMILAR UNOBSTRUCTED SITE. THE NOISE EMISSIONS FROM A COMMON STREAM OF VEHICULAR TRAFFIC WERE MEASURED AT BOTH SITES SIMULTANEOUSLY AND COMPARED TO EVALUATE THE PERFORMANCE OF THE BARRIER. A 1000-FOOT-LONG BARRIER AT EFFECTIVE HEIGHTS OF 2.8, 6.8, 10.8 AND 14.8 FEET WAS MEASURED AND EVALUATED. INCLUDED IN THIS REPORT ARE THE STATISTICAL NOISE DATA FROM FOURTEEN MEASURING SYSTEMS FOR EACH BARRIER CONFIGURATION ALONG WITH SPECTRAL DATA, TRAFFIC INFORMATION AND METEOROLOGICAL CONDITIONS. RESULTS WERE THAT PREDICTED INSERTION LOSS VALUES, OBTAINED USING THE METHOD PROPOSED BY THE HWY. RES. BOARD IN REPORT 144 OF THE NATIONAL COOPERATIVE HWY. RES. PROG., WERE GENERALLY LOWER THAN THOSE MEASURED, EXCEPT AT THE LOWEST OBSERVATION HEIGHT OF THREE FT; THE EFFECT ON THE INSERTION LOSS OF THE BARRIER BY ADDING AN ABSORPTIVE TREATMENT (TWO IN. FIBERGLASS BOARD) TO THE BARRIER WAS TOO SMALL TO BE OF PRACTICAL SIGNIFICANCE FOR OBSERVATION POINTS BEHIND THE BARRIER. IN ADDITION, THE LARGEST MEASURED VALUE OF INSERTION LOSS, BASED ON L50 DATA, WAS 13DB (A VALUE OBTAINED 55 FT BEHIND THE BARRIER AT A MICROPHONE HEIGHT OF 8 FT); THE EFFECTIVE BARRIER HEIGHT WAS 14.8 FT, THE MAXIMUM HEIGHT TESTED. FOR BARRIER HEIGHTS OTHER THAN 3 FT, THE LARGEST INSERTION LOSS DOES NOT NECESSARILY OCCUR AT THE LOWEST OBSERVATION POINT. TO IMPROVE THE PREDICTION PROCEDURE, MORE ATTENTION SHOULD BE PAID TO THE FREQUENCY DEPENDENCE OF THE TRANSMISSION CHARACTERISTICS ALONG THE PATH FROM SOURCE TO RECEIVER.

by E. J. RICKLEY; U. INGARD; Y. C. CHO; R. W. QUINN  
TRANSPORTATION SYSTEMS CENTER, KENDALL  
SQUARE, CAMBRIDGE, MASS. 02142; SONOTECH, INC.,  
TABOR HILL RD., LINCOLN, MASS. 01773  
Rept. No. DOT-TSC-NHTSA-78-24; 1978; 240P 9REFS  
REPT. FOR SEP 1975-SEP 1976.  
Availability: NTIS

HS-803 291

**ANALYSIS OF FEDERAL STIMULI TO  
DEVELOPMENT OF NEW TECHNOLOGY BY  
SUPPLIERS TO AUTOMOBILE MANUFACTURERS.  
AN EXPLORATORY STUDY OF BARRIERS AND  
FACILITATORS. FINAL REPORT**

THIRTY-TWO INNOVATIONS IN AUTOMOBILE BODY/INTERIOR, AIR/FUEL SYSTEM, TRANSMISSION, ELECTRICAL SYSTEM, BRAKE SYSTEM AND ENGINE COMPONENTS, AND IN NEW MATERIALS AND NEW BODY MANUFACTURING PROCESSES, ARE INVESTIGATED BY MEANS OF INTERVIEWS WITH 15 MANAGERS OF 13 FIRST-LEVEL AUTOMOBILE INDUSTRY SUPPLIERS. FOR EACH OF THE 32 INNOVATIONS A MINI-CASE OR "CASELETTE" WAS CREATED AND INFORMATION ON THEIR SUCCESS/FAILURE, AREA OF IMPACT, AND KEY DECISION POINTS WAS GENERATED. BASED ON THESE DATA, BARRIERS AND FACILITATORS OF THE INNOVATION PROCESS ARE IDENTIFIED. THE MOST FREQUENTLY MENTIONED BARRIERS TO INNOVATION ARE FEDERAL REGULATIONS, COST, TECHNICAL RELIABILITY, MARKET DEMAND, AND VEHICLE INTEGRITY IMPACT. OTHER BARRIERS WERE LACK OF ADEQUATE TESTING PROCEDURE AND OF TOP MANAGEMENT SUPPORT, CHANGES NEEDED IN MANUFACTURING PROCESS, AND LACK OF FEDERAL INTEREST OR COMPETENCE. IDENTIFIED AS COMMON FACILITATORS ARE FEDERAL LAWS, THE INCENTIVE OF SOLVING A PERSISTENT PROBLEM, RECOGNITION OF MARKET POTENTIAL, DIRECT GOVERNMENT RESEARCH AND DEVELOPMENT, AND THE TECHNOLOGICAL CAPABILITY OF SUPPLIERS. FEDERAL PROCUREMENT POLICIES, AVAILABILITY OF FEDERAL INFORMATION, AND GOVERNMENT FINANCIAL INCENTIVES WERE LESS FREQUENTLY MENTIONED. APPENDED ARE AN INTERVIEW GUIDE AND SELECTED EXCERPTS FROM PERTINENT LITERATURE.

by ALBERT H. RUBENSTEIN; JOHN E. ETTLIE  
A. H. RUBENSTEIN AND ASSOCIATES, 2348 RIDGE  
AVE., EVANSTON, ILL. 60201  
TS-13215  
Rept. No. DOT-TSC-NHTSA-78-22; 1978; 77P 6REFS  
Availability: NTIS

HS-803 298

**MASS DISTRIBUTION OF THE HUMAN BODY  
USING BIOSTEREOMETRICS. FINAL REPORT**

STEREOPHOTOGRAMMETRY WAS USED TO OBTAIN STEREOOMETRIC DATA IN THE FORM OF CARTESIAN COORDINATES OF SIX SEGMENTED HUMAN CADAVERS. DENSITY DATA PROVIDED WERE THEN USED IN CONJUNCTION WITH THE STEREOOMETRIC DATA TO GENERATE MASS, VOLUME, CENTER OF MASS AND PRINCIPAL MOMENTS OF INERTIA ABOUT THE PRINCIPAL AXES OF INERTIA WITH THE AID OF AN IBM 360/50 DIGITAL COMPUTER. MASS DISTRIBUTION OF THE SAME SIX SEGMENTED CADAVERS WAS DETERMINED EXPERIMENTALLY IN A COMPANION STUDY UNDERTAKEN IN 1975. COMPARA-

TWO STUDIES CONTINUES, BUT PRELIMINARY EXAMINATION SUGGESTS THAT THE BIOSTEREOMETRIC AND PENDULUM BASED MEASUREMENTS OF MASS DISTRIBUTION CORRELATE VERY WELL. AS MORE COMPLETE AND MORE ACCURATE HUMAN DENSITY DATA BECOME AVAILABLE, RESULTS BASED ON BIOSTEREOMETRIC COMPUTATION ARE EXPECTED TO COME EVEN CLOSER TO THE "TRUE" MASS DISTRIBUTION VALUES. WITH THE GROWING USE OF DIGITAL COMPUTERS FOR ANALYTIC AND SIMULATION PURPOSES THE POTENTIAL OF BIOSTEREOMETRICS FOR GENERATING BIOMECHANICAL AND BIOMEDICAL PARAMETERS WARRANTS FURTHER STUDY AND IMPLEMENTATION WHERE APPROPRIATE.

by R. E. HERRON; J. R. CUZZI; J. HUGG  
TEXAS INST. FOR REHABILITATION AND RES.,  
BIOSTEREOMETRICS LAB., 1333 MOORSUND AVE.,  
HOUSTON, TEX. 77030  
DOT-HS-017-2-3151A; REF-F33615-74-C-5121  
1977; 204P 12REFS  
REPT. FOR JUL 1974-JUN 1976.  
Availability: NTIS

HS-803 311

**SOLID STATE DATA ACQUISITION AND  
PROCESSING SYSTEM (SSDAPS). VOL. 3:  
DESCRIPTION, INSTALLATION, CALIBRATION,  
AND OPERATING PROCEDURES. FINAL REPORT**

A PORTABLE DATA ACQUISITION AND ANALYSIS SYSTEM DESIGNED FOR STUDIES OF VEHICLE DYNAMICS, BRAKING, AND DRIVER BEHAVIOR IS DESCRIBED. IT CONSISTS OF A FULL COMPLEMENT OF INSTRUMENTATION SENSORS; DATA ACQUISITION AND SIGNAL CONDITIONING MODULES; 62 CHANNEL FM/VHF DIGITAL TELEMETRY (46 ACTIVE AT THIS TIME); AND BASE STATION WITH PDP-11 MINICOMPUTER, TELETYPE, AND DIGITAL MAGNETIC TAPE DRIVE. SEVERAL UNIQUE FEATURES INCLUDE ONBOARD COMPUTATIONS OF SIDESLIP VELOCITY AND LATERAL POSITION, ROAD REFERENCED ACCELERATIONS, AND DRIVE LINE TORQUE, PLUS AN INTERACTIVE DRIVER DISPLAY PANEL. THE ON-BOARD SYSTEM PROVIDES A RELATIVELY SMALL, LIGHT, EFFICIENT PACKAGE WHICH CAN BE INSTALLED IN ANY COMPACT OR LARGER AUTOMOBILE WITH A MINIMUM OF DIFFICULTY. THIS REPORT IS THE THIRD IN A SERIES OF THREE REPORTS WHICH COMPRISE THE FINAL REPORT, THE FIRST TWO PROVIDING A SUMMARY SYSTEM DESCRIPTION AND VERIFICATION TEST REPORT, THIS LAST PROVIDING A MORE DETAILED DESCRIPTION OF THE SSDAPS, ITS INSTALLATION, CALIBRATION AND OPERATION. RECEIVING STATION EQUIPMENT AND OPERATING FEATURES ARE REVIEWED. APPENDICES INCLUDE AN ON-BOARD COMPUTATION SUMMARY, A LIST OF DRAWINGS, SENSOR INTERCONNECTION DRAWINGS, A LIST OF SPECIAL TOOLS REQUIRED, DATA SHEETS FOR CALIBRATION, AND

HS-803 315

**MANUFACTURER'S SPECIFICATION SHEETS FOR KEY SUBSYSTEM ELEMENTS.**

by ARTHUR A. BLAUVELT; RICHARD A. PETERS;  
DUANE T. MCRUER  
SYSTEMS TECHNOLOGY, INC., 13766 S. HAWTHORNE  
BLVD., HAWTHORNE, CALIF. 90250  
DOT-HS-5-01212  
1977; 335P 17REFS  
Availability: NTIS

HS-803 315

**A STUDY OF BICYCLE/MOTOR-VEHICLE ACCIDENTS: IDENTIFICATION OF PROBLEM TYPES AND COUNTERMEASURE APPROACHES. VOL. 1, TEXT. FINAL REPORT**

TO DETERMINE THE CAUSES OF BICYCLE/MOTOR-VEHICLE ACCIDENTS AND TO USE DATA ON ACCIDENT CAUSATION TO IDENTIFY POTENTIAL COUNTERMEASURE APPROACHES, INTERVIEWS AND ON-SITE INVESTIGATIONS FOR 753 NONFATAL ACCIDENTS AND 166 FATAL ACCIDENTS WERE CONDUCTED IN FOUR SAMPLING AREAS, EACH CONSISTING OF SEVERAL CONTIGUOUS COUNTIES, IN CALIFORNIA, COLORADO, FLORIDA, AND MICHIGAN. ACCIDENT CASES WERE CLASSIFIED INTO "PROBLEM TYPES" BASED UPON TRAFFIC CONTEXT, ACCIDENT CAUSES, AND TARGET GROUPS. THIRTY-SIX UNIQUE PROBLEM TYPES WERE IDENTIFIED; THE TEN MOST FREQUENT ACCOUNTED FOR 67% OF THE FATAL CASES AND 64% OF NONFATAL. SEVEN OF THE PROBLEM TYPES WERE: AT JUNCTIONS OF ROADWAYS AND RESIDENTIAL DRIVEWAYS OR ALLEYS; WHEN BICYCLISTS FAILED TO STOP AT STOP SIGNS; WHEN MOTORISTS ATTEMPTED TO ENTER A ROADWAY FROM A COMMERCIAL DRIVEWAY; WHEN MOTORISTS ENTERING AN INTERSECTION FROM A STOP SIGN COLLIDED WITH BICYCLISTS ON AN UNCONTROLLED LEG OF THE INTERSECTION; WHEN MOTORISTS OVERTOOK AND COLLIDED WITH A BICYCLIST, PARTICULARLY AT NIGHT; WHEN BICYCLISTS TURNED LEFT WITHOUT LOOKING OR SIGNALING; WHEN MOTORISTS TURNED LEFT AND COLLIDED WITH BICYCLISTS APPROACHING FROM THE OPPOSITE DIRECTION. COUNTERMEASURES FOR EACH PROBLEM TYPE ARE LISTED. IT IS CONCLUDED THAT THE VAST MAJORITY OF BICYCLE/MOTOR VEHICLE ACCIDENTS ARE BEHAVIORAL IN CAUSE, NOT THE RESULTS OF SUCH FACTORS AS ROADWAY/SURFACE DEFECTS, DEBRIS, BICYCLE DEFECTS, RIDING DOUBLE OR IGNORANCE OF THE LAW. THE MOST IMPORTANT NONBEHAVIORAL FACTORS CONTRIBUTING TO ACCIDENTS INCLUDE VISUAL OBSTRUCTIONS, NARROW ROADWAYS, DARKNESS, CONSPICUITY OF BICYCLES, AND THE VERTICAL DIMENSION OF THE BICYCLE/BICYCLIST UNIT. RECOMMENDATIONS INCLUDE DISSEMINATION OF INFORMATION, EVALUATION AND REFINEMENT OF COUNTERMEASURE APPROACHES, AND IMPLEMENTATION OF SELECTIVE ENFORCEMENT PRO-

HSL 78-12

**GRAMS, PARTICULARLY WITH RESPECT TO JUVENILES.**

by KENNETH D. CROSS; GARY FISHER  
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DOT-HS-4-00982  
1977; 304P 37REFS  
REPT. FOR JUN 1974-SEP 1977. APPENDICES A-D ARE  
IN VOL. 2, HS-803 316; APPENDICES E-G ARE IN VOL. 3,  
HS-803 317.  
Availability: NTIS

HS-803 316

**A STUDY OF BICYCLE/MOTOR-VEHICLE ACCIDENTS: IDENTIFICATION OF PROBLEM TYPES AND COUNTERMEASURE APPROACHES. VOL. 2, APPENDICES A-D. FINAL REPORT**

APPENDIX A CONTAINS THE FIELD INVESTIGATOR'S INSTRUCTION MANUAL WITH PRE-INTERVIEW PROCEDURES AND METHODS (SELECTION OF SPECIFIC ACCIDENT CASES, SOLICITATION OF COOPERATION, PRELIMINARY STUDY AND ON-SITE INSPECTION OF ACCIDENT LOCATION), INSTRUCTIONS FOR INTERVIEWING BICYCLISTS, MOTORISTS AND WITNESSES, AND PROCEDURES FOR ASSESSING CAUSAL FACTORS. SPECIMENS OF THE QUESTIONNAIRES AND DATA COLLECTION INSTRUMENTS ARE CONTAINED IN APPENDIX B, INCLUDING A DESCRIPTIVE DATA FORM, BICYCLIST, MOTORIST AND WITNESS INTERVIEW FORMS, ACCIDENT DIAGRAM SYMBOLS, SPEED CONVERSION TABLES, SLOPE GRADIENT MEASUREMENT SHEET, PROCEDURE AND DEFINITION OF QUANTITIES FOR MEASURING RADIUS OF CURVATURE, BICYCLIST CHECKLISTS, INJURY LOCATION DRAWINGS, POINT-OF-IMPACT IDENTIFICATION, BICYCLIST AND MOTORIST RATING SCALES, MOTOR VEHICLE CONDITION CHECKLIST, DATA SHORT FORMS (NO INTERVIEW) AND FIELD INVESTIGATOR'S ASSESSMENT SHEETS. APPENDIX C DETAILS THE PROCEDURES FOR POST-INTERVIEW EVALUATION: PRELIMINARY STUDY, EVALUATION OF OPERATOR CULPABILITY AND IDENTIFICATION OF FUNCTION FAILURES AND CAUSAL FACTORS, AS WELL AS INSTRUCTIONS FOR RATING THE EVALUATOR'S CONFIDENCE IN THE ASSESSMENT OF FUNCTION FAILURE AND CONTRIBUTING FACTORS, AND FOR ENCODING THE TRAFFIC CONTEXT AND PROXIMAL BEHAVIOR OF EACH OPERATOR. SUPPORTING DATA ARE CONTAINED IN APPENDIX D (INJURY TYPE AND LOCATION, CONTRIBUTING FACTORS, AND DATA SUMMARY SHEETS FOR THE 36 PROBLEM TYPES IDENTIFIED).

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DOT-HS-4-00982  
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**A STUDY OF BICYCLE/MOTOR VEHICLE  
ACCIDENTS: IDENTIFICATION OF PROBLEM  
TYPES AND COUNTERMEASURE APPROACHES.  
VOL. 3, APPENDICES E-G. FINAL REPORT**

THIS VOLUME IS A CODING INDEX DESCRIBING THE MANNER IN WHICH EACH DATA ITEM WAS ENCODED. APPENDIX E CONTAINS THE CODING INDEX-ACCIDENT DATA FORMS (DESCRIPTIVE DATA FORMS, BICYCLIST AND MOTORIST INTERVIEW FORMS, AND MOTORIST AND BICYCLIST SHORT FORMS). APPENDIX F CONSISTS OF THE CODING INDEX-POST-INTERVIEW EVALUATION, FUNCTION FAILURES AND CAUSAL FACTORS (CODING FOR PREPARATORY PHASE FUNCTIONS, FOR SUBOPTIMAL COURSE, FOR ANTICIPATORY PHASE FUNCTIONS AND FOR REACTIVE PHASE FUNCTIONS). APPENDIX G IS A CODING INDEX-POST-INTERVIEW EVALUATION, TRAFFIC CONTEXT AND PROXIMAL BEHAVIOR.

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DOT-HS-4-00982  
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**MULTIDISCIPLINARY ACCIDENT INVESTIGATION  
SUMMARIES. VOL. 8, NO. 1**

CASE REPORTS OF IN-DEPTH ACCIDENT INVESTIGATIONS ARE SUMMARIZED. THESE INVESTIGATIONS ARE BEING CONDUCTED TO IDENTIFY CONTRIBUTING FACTORS AND INJURY CAUSATION, TO EVALUATE THE EFFECTIVENESS OF COUNTERMEASURES, AND TO DETECT DESIGN AND FUNCTIONAL PROBLEMS OF THE VEHICLE AND HIGHWAY. THE REPORTS ARE INDIVIDUAL, CLINICAL STUDIES OF ACCIDENTS, GENERALLY INVOLVING VEHICLES IN THE LAST THREE MODEL YEARS, OF FATAL, INJURY PRODUCING, OR PROPERTY DAMAGE SEVERITY. EACH SUMMARY CONSISTS OF IDENTIFICATION INFORMATION INCLUDING TIME, DATE, AND LOCATION OF THE ACCIDENT, A DESCRIPTION OF THE HIGHWAY, VEHICLES, DRIVERS, AND OCCUPANTS INVOLVED, A NARRATIVE OF THE SEQUENCE OF EVENTS OF THE COLLISION INCLUDING DETAILS OF THE PRECRASH, CRASH, AND POSTCRASH PHASES, AN ASSESSMENT OF INJURIES AND DAMAGE, AND A LIST OF APPLICABLE STANDARDS, CAUSAL FACTORS, CONCLUSIONS, AND RECOMMENDATIONS. A DIAGRAM OF EACH COLLISION IS INCLUDED. SUMMARIES OF 50 CASE REPORTS ARE GIVEN.

NATIONAL CENTER FOR STATISTICS AND ANALYSIS,  
ACCIDENT INVESTIGATION DIV.  
1978; 495P  
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**DEVELOPMENT OF AN IN-TRAFFIC TEST FOR  
MOTORCYCLISTS. FINAL REPORT**

THE DEVELOPMENT AND PRELIMINARY EVALUATION OF A SET OF IN-TRAFFIC TEST PROCEDURES FOR MOTORCYCLE OPERATORS, THE MOTORCYCLIST IN-TRAFFIC TEST (MIT), FOR USE IN STATE LICENSING PROGRAMS ARE DESCRIBED. THE CONTENT OF THE MIT WAS OBTAINED BY SELECTING FROM THE "MOTORCYCLE TASK ANALYSIS" (1974) THOSE BEHAVIORS THAT ARE BOTH CRITICAL TO SAFETY AND POTENTIALLY CAPABLE OF BEING ASSESSED IN THE HIGHWAY TRAFFIC ENVIRONMENT. THE BEHAVIORS AND THEIR SUPPORT KNOWLEDGE AND SKILLS WERE ORGANIZED INTO THE FOLLOWING SEVEN CATEGORIES FOR TEST DEVELOPMENT PURPOSES: OBSERVING, POSITIONING (SEPARATION AND VISIBILITY), SELECTING GAPS, CONTROLLING SPEED, BASIC CONTROL TASK, COMMUNICATING, AND RESPONDING TO ROADWAY AND TRAFFIC CHARACTERISTICS. SIXTY CANDIDATE BEHAVIORS WERE THEN REVIEWED BY A PANEL OF MOTORCYCLE AND LICENSING SPECIALISTS WHO RATED THE BEHAVIORS IN TERMS OF THE FEASIBILITY OF ESTABLISHING THE CONDITIONS NEEDED TO ELICIT THE BEHAVIOR, AND THE ABILITY OF AN EXAMINER TO OBSERVE THE BEHAVIOR WHEN IT OCCURRED. VARIOUS APPROACHES TO IN-TRAFFIC PERFORMANCE MEASUREMENT WERE TRIED OUT AND EVALUATED. THESE APPROACHES REPRESENTED ALTERNATIVE MEANS OF PROVIDING EXAMINER TRANSPORTATION, CREATING TEST STIMULI, POSITIONING THE EXAMINER DURING THE TEST, GUIDING THE APPLICANT, CUEING THE EXAMINER, AND RECORDING PERFORMANCE. THE TEST THAT EMERGED FROM THESE DESIGN ACTIVITIES CONSISTS OF 21 HIGHWAY AND TRAFFIC SITUATIONS CALLING FOR BEHAVIOR IN THE FOLLOWING CATEGORIES: OBSERVATION, SIGNALING, LONGITUDINAL POSITIONING, LATERAL POSITIONING, AND GAP SELECTION. THE TEST WAS ADMINISTERED BY REGULAR LICENSE EXAMINERS IN THE STATE OF TENNESSEE WITH THE FOLLOWING RESULTS: EXAMINER RELIABILITY, .6; SAMPLING (TEST-RETEST) RELIABILITY, .62; CORRELATION WITH EXPERTS RATINGS, .6; AND CORRELATION WITH MOTORCYCLE OPERATOR SKILL TEST (MOST), .5. APPENDED ARE DESCRIPTIONS OF PRELIMINARY IN-TRAFFIC TEST BEHAVIORS, RESPONSES OF APPLICANTS TO QUESTIONS ABOUT THE MIT, AND TWO COMPANION DOCUMENTS (ADMINISTRATOR'S MANUAL AND EXAMINER'S MANUAL).

by KENARD MCPHERSON; A. JAMES MCKNIGHT;  
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ST., ALEXANDRIA, VA. 22314  
DOT-HS-7-01526  
1978; 260P 8REFS  
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**EMPIRICAL CRASH INJURY MODELING AND VEHICLE-SIZE MIX**

CRASH INJURY PREDICTION MODELS WERE DEVELOPED USING DATA FROM THE CPIR (COLLISION PERFORMANCE AND INJURY REPORT) FILE FOR CRASHES WHICH OCCURRED SINCE 1 JAN 1970 INVOLVING 1969 OR NEWER CARS, VANS, AND PICKUP TRUCKS. HOSTILE AND PROTECTIVE EFFECTS OF VEHICLE SIZE WERE SEPARATED, IN ADDITION TO INJURY SEVERITY (ABBREVIATED INJURY SCALE OR AIS) INCREASES WITH AGE, FRONT SEAT POSITION, AND LACK OF RESTRAINTS. DIFFERENCES BY CRASH CONFIGURATION WERE ALSO ISOLATED. ELASTICITY OF INJURY WITH RESPECT TO AVERAGE VEHICLE WEIGHT CHANGE WAS COMPUTED AS -0.67 USING THESE MODELS. FUEL COST DECREASES WERE COMPARED WITH INJURY COST INCREASES AS VEHICLE WEIGHT DECREASES. ELASTICITY OF FUEL COST WITH RESPECT TO VEHICLE WEIGHT WAS ESTIMATED AT 0.86. FUEL COST SAVINGS EXCEED INJURY COST INCREASES AS VEHICLE WEIGHT IS REDUCED, ASSUMING NO CHANGE IN THE RELATIONSHIP BETWEEN VEHICLE VOLUME AND VEHICLE WEIGHT. AN ESTIMATED NET BENEFIT OF \$213 PER MILLION MILES OF VEHICLE TRAVEL WAS OBTAINED. INJURY REDUCTION FROM LARGER AND LIGHTER VEHICLES AND FROM IMPROVED VEHICLE DESIGN COULD INCREASE THE DIFFERENCE EVEN MORE.

by WILLIAM L. CARLSON  
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ADMINISTRATION, WASHINGTON, D.C. 20590  
1978; 34P 16REFS  
Availability: NTIS

HS-803 351

**IMPACT RESISTANCE OF NON-FERROUS PASSENGER CAR WHEELS. FINAL REPORT**

RESULTS OF AN IMPACT TESTING PROGRAM OF FERROUS AND NONFERROUS PASSENGER CAR WHEELS ARE REPORTED. THE ADOPTION OF A NEW IMPACT TEST IS BEING CONSIDERED AS A SAFEGUARD TO PREVENT BRITTLE FRACTURE FAILURES IN THE LIGHTWEIGHT ALLOY WHEELS THAT ARE RECEIVING AN INCREASING DEMAND ON THE AMERICAN MARKET. DUE TO MANY OBJECTIONS OF THE J175 TEST, THE PROPOSED PROCEDURE ISO/TC22/SC19/WG3-N15 WAS UTILIZED. THE TESTING OF THE TWO TYPES OF WHEELS WAS UNDERTAKEN IN ORDER THAT THE NATURE AND EXTENT OF FAILURES COULD BE COMPARED, THE SIGNIFICANCE OF MATERIAL STRENGTH AND DUCTILITY COULD BE ASSESSED, AND THE ADAPTABILITY TO A FEDERAL STANDARD COULD BE DETERMINED. THE PROGRAM CONSISTED OF THE FOLLOWING THREE PHASES WHICH ARE SEPARATELY DESCRIBED: PURCHASE OF TEST COMPONENTS (18 ALUMINUM AND 12 STEEL WHEELS), FABRICATION AND CALIBRATION OF TEST MACHINE (PATTERNED AFTER THE BRITISH WHEEL IMPACT MACHINE), AND IMPACT TESTING OF THE 30 WHEELS. DROP HEIGHT WAS 230 MM. CRITERIA FOR FAILURE INCLUDED

VISIBLE FRACTURES OF THE CENTER MEMBER OF THE WHEEL ASSEMBLY, SEPARATION OF CENTER MEMBER FROM THE RIM, AND TOTAL, SILENT LOSS OF TIRE AIR PRESSURE. APPENDED ARE PHOTOGRAPH OF THE TEST MACHINE, MACHINE CALIBRATION CHART, PHOTOGRAPHS OF WHEEL FRACTURES, AND A TABULATED SUMMARY OF TEST RESULTS.

by LARRY BOWERS; JERRY G. WALLINGFORD  
EG AND G AUTOMOTIVE RES., INC., 5404 BANDER  
RD., SAN ANTONIO, TEX. 78238  
DOT-HS-7-01657  
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Availability: NTIS

HS-803 354

**SAFETY BELT USAGE: SURVEY OF THE TRAFFIC POPULATION. FINAL REPORT**

SAFETYBELT USAGE IN THE U.S. IN CARS MANUFACTURED BETWEEN 1964 AND 1977 WAS ASSESSED; USAGE, AS A FUNCTION OF TYPE OF CAR, DRIVING CHARACTERISTICS, AND DRIVING ENVIRONMENT WAS EXAMINED. A SURVEY OF PASSENGER CARS IN 16 CITIES (ATLANTA, GA.; BALTIMORE, MD.; BIRMINGHAM, ALA.; BOSTON, MASS.; CHICAGO, ILL.; FARGO-MOREHEAD, N. DAK.; DALLAS, TEX.; HOUSTON, TEX.; LOS ANGELES, CALIF.; NEAPOLIS-ST. PAUL, MINN.; NEW YORK, N.Y.; PHOENIX, ARIZ.; PITTSBURGH, PA.; SAN DIEGO, CALIF.; SAN FRANCISCO, CALIF.; AND SEATTLE, WASH.) WAS CONDUCTED ACROSS AN EIGHT-MONTH PERIOD OBSERVING SAFETYBELT USAGE BY DRIVERS. THEY STOPPED FOR TRAFFIC SIGNALS AT PRIMARY ROAD INTERSECTIONS AND FREEWAY EXITS. A SUPPLEMENTARY SURVEY WAS CONDUCTED AT O'HARE AIRPORT (CHICAGO) RENTAL CAR CHECK-OUTS TO COMPARE USAGE OF SINGLE VS. DUAL RETRACTABLE SAFETY BELTS. OVERALL SAFETYBELT USAGE WAS FOUND TO BE 18.5%, WITH USAGE OF THE SHOULDER COMBINATION BELT SYSTEM SIGNIFICANTLY HIGHER THAN THAT OF THE SHOULDER SEPARATE OR LAP-BELT ONLY SYSTEM. IN TERMS OF MODEL YEAR, USAGE WAS HIGHER FOR 1974 CARS. USAGE IN TERMS OF CAR STYLE WAS HIGHER FOR SMALLER THAN LARGER CARS. FINDING PARALLELED A DIFFERENTIAL USAGE BY CAR MANUFACTURER IN TERMS OF THE SIZE OF THE CARS THESE MANUFACTURERS PRODUCE. OTHER FINDINGS WERE THAT USAGE WAS HIGHER ON THE WEST COAST THAN ON THE EAST COAST, HIGHER AT FREEWAY EXITS THAN AT PRIMARY ROAD INTERSECTIONS, AND HIGHER DURING RUSH HOURS THAN DURING OTHER TIMES OF THE DAY. MEN TENDED TO WEAR SAFETY BELTS LESS OFTEN THAN WOMEN, AND OLDER DRIVERS USED SAFETY BELTS LESS OFTEN THAN YOUNGER ONES. DRIVERS WITH CORRECTLY POSITIONED HEAD RESTRAINTS TENDED TO WEAR SAFETY BELTS MORE OFTEN THAN THOSE WITH HEAD RESTRAINTS INCORRECTLY POSITIONED. THE RESULTS OF THE O'HARE RENTAL CAR SURVEY INDICATED NO DIFFERENCE

December 31, 1978

HS-803 360

IN USAGE RATES BETWEEN THE SINGLE AND DUAL  
RETRACTOR SYSTEMS.

by CAROL STOWELL; JOSEPH BRYANT  
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WASHINGTON, D.C. 20036  
DOT-HS-6-01340  
1978; 84P  
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Availability: NTIS

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### **AUTO REPAIR AND MAINTENANCE. PROGRAMS TO REDUCE CONSUMER LOSS**

A NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION TASK FORCE SYSTEMATICALLY ANALYZED THE AUTO REPAIR PROCESS AND ESTIMATED THAT CONSUMERS LOSE ABOUT \$20 BILLION ANNUALLY DUE TO IMPROPER OR UNNECESSARY REPAIR AND MAINTENANCE PRACTICES. THE LOSSES CONSIST OF WASTED REPAIR EXPENDITURES, WASTED FUEL, AVOIDABLE ACCIDENTS AND POLLUTION, AND REDUCED CAR LIFE. AN INITIAL SET OF REMEDY CATEGORIES WAS PREPARED AND INCLUDED DIAGNOSTIC INSPECTION, VEHICLE STANDARDS, CONSUMER INFORMATION ON VEHICLES, AND STATE AND LOCAL ACTIONS (MODEL LAWS, RATING OF REPAIR FACILITIES, COMPLAINT HANDLING SYSTEMS, AND EDUCATION). EXCEPT FOR CONSUMER INFORMATION ON VEHICLES WHICH IS BEING STUDIED SEPARATELY UNDER TITLE II OF THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT, THE TASK FORCE IDENTIFIED AND EVALUATED 22 POTENTIALLY EFFECTIVE AND FEASIBLE REMEDIES INVOLVING FEDERAL, STATE, LOCAL, OR PRIVATE ACTION. THE TASK FORCE THEN DEFINED 12 ALTERNATIVE ACTION PROGRAMS (PACKAGES OF ONE OR MORE OF THE REMEDIES) WITH ESTIMATED BENEFITS RANGING FROM APPROXIMATELY \$1.5 BILLION TO \$8.3 BILLION. APPENDED ARE A LISTING OF THE 12 ALTERNATIVE PROGRAM PACKAGES, WITH ESTIMATED BENEFITS AND COSTS IN DOLLARS, AND TIME REQUIRED FOR IMPLEMENTATION; THE BASIS AND DESCRIPTION OF THE INDIVIDUAL REMEDIES (MODEL STATE CONSUMER LAW ON AUTOMOBILE REPAIR, REPAIR FACILITY RATING SYSTEMS, FEDERAL MOTOR VEHICLE MAINTAINABILITY STANDARDS, DIAGNOSTIC INSPECTION, MODEL CONSUMER COMPLAINT ADMINISTRATION SYSTEM, AND CONSUMER EDUCATION IN AUTO MAINTENANCE); AND A REPAIR PROCESS AND CONSUMER LOSS SIMULATION MODEL.

by F. G. EPHRAIM; C. J. KAHANE; W. G. LAHEIST  
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WASHINGTON, D.C. 20590  
1978; 105P REFS  
Availability: NTIS

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### **PERFORMANCE TESTING OF AN IMPROVED DRIVER RESTRAINT SYSTEM FOR SUBCOMPACT CARS. VOL. 1--SUMMARY REPORT**

by J. M. BURKES; G. C. LAWRASON  
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DOT-HS-4-00933  
1977; 30P  
FOR ABSTRACT, SEE HS-803 360.  
Availability: NTIS

HS-803 360

### **PERFORMANCE TESTING OF AN IMPROVED DRIVER RESTRAINT SYSTEM FOR SUBCOMPACT CARS. VOL. 2--FINAL REPORT**

RESULTS ARE REPORTED FOR WORK ACCOMPLISHED UNDER THE ORIGINAL SCOPE OF TASK ORDER 2 (31 DYNAMIC SLED TESTS (12 CALIBRATION AND 19 DUMMY TESTS) TO EVALUATE THE PERFORMANCE OF AN AIR BAG DEPLOYED FROM AN ENERGY-ABSORBING STEERING COLUMN AND AN ENERGY-ABSORBING KNEE RESTRAINT), WORK COMPLETED IN FULFILLMENT OF MODIFICATION A (78 EMERGENCY RETRACTOR LOCK-UP TESTS ON CURRENT BELT RESTRAINT SYSTEMS), AND WORK COMPLETED IN FULFILLMENT OF MODIFICATION B (FOUR DYNAMIC SLED TESTS (ONE CALIBRATION AND THREE DUMMY TESTS) TO EVALUATE THE INFLUENCE OF BELT SLACK ON THE PERFORMANCE OF THE WINDOW SHADE BELTED RESTRAINT SYSTEM). FOR THE FIRST SERIES OF TESTS, 19 DUMMIES WERE SUBJECTED TO IMPACT CONDITIONS VARYING FROM FRONTAL TO 30° OBLIQUE AND RANGING FROM 17.5 MPH TO 50 MPH TOTAL VELOCITY CHANGE. THE RESULTS INDICATE THAT THE OCCUPANT PROTECTION PROVIDED BY THE IMPROVED DRIVER RESTRAINT SYSTEM IS MARGINAL AT 50 MPH AND DEPENDS UPON IMPACT DIRECTION AND OCCUPANT SIZE; THE GREATER THE OBLIQUITY OF THE IMPACT DIRECTION FROM FRONTAL, THE GREATER THE INJURY POTENTIAL AND THE LARGER THE OCCUPANT SIZE, THE GREATER THE INJURY POTENTIAL. IN THE SECOND SERIES OF TESTS, THE EMERGENCY LOCKING RETRACTORS PERFORMED AS SPECIFIED DURING THE 78 FULL-SCALE VEHICLE STOPPING TESTS THAT WERE CONDUCTED. IN THE FINAL SERIES OF TESTS, RESULTS INDICATE THAT UNDER SEVERE IMPACT CONDITIONS (35 MPH TOTAL VELOCITY CHANGE), BELT SLACK CONTRIBUTES TO FAILURE OF WINDOW SHADE BELTED RESTRAINT SYSTEMS.

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DOT-HS-4-00933  
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**SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, REPORTED TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION BY DOMESTIC AND FOREIGN VEHICLE MANUFACTURERS, JANUARY 1, 1978 TO MARCH 31, 1978**

THIS TABULATION OF SAFETY DEFECT RECALL CAMPAIGNS INCLUDES THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION (NHTSA) IDENTIFICATION NUMBER, DATE OF COMPANY NOTIFICATION, MAKE, MODEL, MODEL YEAR, BRIEF DESCRIPTION OF DEFECT AND MANUFACTURER'S CORRECTIVE ACTION, NUMBER OF PAGES ON FILE, AND NUMBER OF VEHICLES RECALLED. BUSES, AUTOMOBILES, TRUCKS, MOTOR HOMES, TRAILERS, UTILITY VEHICLES, VANS, MOTORCYCLES, MOPEDS, HELMETS, JACKS, AUXILIARY TRANSMISSIONS, CERTIFICATION LABELS, ALUMINUM HUBS, PUSH-BAR CONTROLLERS, AND TIRES ARE INCLUDED. THE STATUS OF DOMESTIC AND FOREIGN CAMPAIGNS COMPLETED AS OF 31 DEC 1977 IS ALSO GIVEN.

NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, WASHINGTON, D.C. 20590  
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**THE EVALUATION OF 1975 TORINO TYPE 2 BELT RESTRAINT SYSTEMS WITH WEB LOCKING AND FORCE LIMITING FEATURES. TEST REPORT**

DATA FROM CAR CRASH TESTS ON FORD TORINOS (PHASE C OF A TEST SERIES), CONDUCTED TO EVALUATE THE PERFORMANCE OF ADVANCED RESTRAINT SYSTEMS IN MEETING FEDERAL MOTOR VEHICLE SAFETY STANDARD 208, OCCUPANT CRASH PROTECTION, INJURY CRITERIA, ARE PRESENTED. THREE VARIATIONS OF THE STANDARD FORD TORINO BELT SYSTEMS WERE TESTED AND THE DESIGNATION APPLIED TO EACH RESTRAINT SYSTEM WAS: STANDARD THREE-POINT BELT SYSTEM, STANDARD THREE-POINT BELT SYSTEM WITH WEB LOCKERS, STANDARD THREE-POINT BELT SYSTEM WITH WEB LOCKERS AND FORCE LIMITERS, AND STANDARD THREE-POINT BELT SYSTEM WITH WEB LOCKERS AND TEAR WEBBING. THE STANDARD RESTRAINT SYSTEMS, THE WEB LOCKING MECHANISMS, AND TEAR WEBBING WERE SUPPLIED BY ALLIED CHEMICAL, THE ORIGINAL EQUIPMENT MANUFACTURER FOR THE RESTRAINT SYSTEMS IN THE FORD TORINOS USED. ALSO, EACH STANDARD THREE-POINT BELT SYSTEM WAS FURNISHED WITH POLYESTER WEBBING INSTEAD OF THE NYLON WEBBING ORIGINALLY SUPPLIED. WITH THE EXCEPTION OF A MOUNTING BRACKET ON THE B-PILLAR FOR THE WEB LOCKING MECHANISM, THE FORD TORINOS WERE NOT MODIFIED IN ANY MANNER. THE MATRIX OF IMPACT CONDITIONS COVERED, A

SUMMARY OF TEST RESULTS, AND COMPLETE DATA FROM EACH TEST ARE PRESENTED.

by R. W. CARR; G. M. ABOUD  
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RD., PHOENIX, ARIZ. 85027  
DOT-HS-6-01307  
Rept. No. DSI-8300-77-184; 1977; 213P  
REPT. FOR SEP 1976-SEP 1977.  
Availability: CORPORATE AUTHOR

HS-810 322

**REMARKS BEFORE THE ECONOMIC CLUB OF DETROIT, DETROIT PLAZA HOTEL, APRIL 24, 1978**

THE CORPORATE ASSAULT ON GOVERNMENT REGULATION, PARTICULARLY THAT REGULATION WHICH SPURS BUSINESS TO ADVANCE HEALTH AND SAFETY GOALS FOR THE NATION, IS CRITICIZED, WITH PARTICULAR EMPHASIS ON THE AUTO INDUSTRY. THE BUSINESS SECTOR ACCUSES THE FEDERAL GOVERNMENT OF UNNECESSARY REGULATIONS WHICH CAUSE INFLATION, RETARD INNOVATION, SACRIFICE JOBS, AND DIVERT CAPITAL INVESTMENTS FROM PRODUCTIVE PURSUITS. HEALTH AND SAFETY LAWS THAT REQUIRE INVESTMENT IN PREVENTING HAZARDS TO THE PUBLIC ARE NOT CONSIDERED PRODUCTIVE. WITH RESPECT TO THE DOMESTIC AUTO INDUSTRY'S RELATIONSHIP TO FEDERAL REGULATION, THE INDUSTRY FIGHTS PROPOSED REGULATIONS THAT IT LATER CANDIDLY OR GRUDGINGLY APPROVES. THE BIG THREE'S CREDIBILITY FROM AN HISTORICAL PERSPECTIVE IS NOT HIGH; OFTEN, BY THEIR OWN LATER ADMISSION OR BEHAVIOR, THEY HAVE BEEN PROVEN WRONG OR VERY SHORTSIGHTED. IT IS NOT JUST HOW THINGS TURNED OUT THAT REFLECT ADVERSELY ON THE DOMESTIC INDUSTRY'S CREDIBILITY. IT IS ALSO HOW SOME AUTO COMPANIES A FRACTION THE SIZE OF THE BIG THREE HAVE SHOWN THEY CAN DO WHAT THE BIG THREE STATED COULD NOT BE DONE. THE NEED TO REGULATE THE AUTOMOTIVE SECTOR IS UNDERScoreD BY THE COSTS OF THE FAILURE TO SUFFICIENTLY IMPROVE AUTOMOBILE SAFETY. AN ANALYSIS OF THE SOCIETAL COST OF MOTOR VEHICLE ACCIDENTS FOR 1977 SHOWS IT TO BE \$43 BILLION. AUTOMOBILE FATALITIES ARE THE SIXTH LEADING CAUSE OF DEATH IN THE NATION. A QUANTITATIVE INDEX FOR THE NECESSITY OF REGULATION IS THE NUMBER OF VEHICLES RECALLED EACH YEAR FOR SAFETY-RELATED DEFECTS (AN AVERAGE OF ABOUT 5 MILLION VEHICLES). THE REGULATING OF AVERAGE VEHICLE FUEL ECONOMY IS A MEANS TO CONSERVE PETROLEUM. THE NATIONAL HWY. TRAFFIC SAFETY ADMINISTRATION (NHTSA), IN REGULATING THE AUTO INDUSTRY, IS DIRECTLY ACCOUNTABLE TO CONGRESS AND THE PRESIDENT. FURTHER, COMPANIES HAVE NOT HESITATED TO TAKE FULL ADVANTAGE OF REGULATORY AND JUDICIAL APPEALS TO PROPOSED OR ISSUED REGULATIONS. NHTSA HAS ESTABLISHED PROCEDURES WHICH PROMOTE PUBLIC SCRUTINY AND COMMENTS OF PROPOSED REGULATIONS AND PROCEDURES FOR CONDUCTING DETAILED ECONOMIC IMPACT ASSESSMENTS OF ALL REGULATIONS. ALSO, OVER THE LAST TWO YEARS, NHTSA

HAS BEGUN A SYSTEMATIC EVALUATION OF EXISTING STANDARDS TO DETERMINE THEIR EFFECTIVENESS. THE PRIME SOURCE OF DATA ON THE COSTS OF IMPLEMENTING NHTSA REGULATIONS IS THE MANUFACTURERS THEMSELVES. IT IS SUGGESTED THAT THE AUTO INDUSTRY CONSIDER A LESS NARROW DEFINITION OF FREEDOM, TRY TO REPLACE NEGATIVISM WITH A MORE "CAN DO" ATTITUDE, LOOK FOR MORE WAYS TO ENCOURAGE NEW IDEAS AND ALLOW FULLER EXPRESSIONS OF DISSENT, BE PROUDER OF ITS SAFETY INNOVATIONS, AND IMPROVE THE DESIGN OF SAFETY BELTS AND INCREASE THE EFFORT TO PROMOTE HIGHER RATES OF USAGE.

by JOAN CLAYBROOK  
NATIONAL HWY. TRAFFIC SAFETY  
ADMINISTRATION, WASHINGTON, D.C. 20590  
1978; 24P  
Availability: NHTSA

HS-810 323

**STATEMENT BEFORE THE HOUSE COMMITTEE  
ON PUBLIC WORKS AND TRANSPORTATION,  
SUBCOMMITTEE ON INVESTIGATIONS AND  
REVIEW, JUNE 6, 1978**

THE DEPT. OF TRANSPORTATION (DOT) STRONGLY ADVOCATES USE OF SAFETY BELTS BECAUSE THEY ARE EFFECTIVE IN PREVENTING DEATHS AND INJURIES WHEN PROPERLY WORN. THE LIKELIHOOD OF DEATH OR SERIOUS INJURY IN AN ACCIDENT IS MORE THAN TWO TIMES GREATER FOR UNBELTED FRONT-SEAT OCCUPANTS IN A CRASH THAN FOR OCCUPANTS USING A LAP/SHOULDER BELT. SINCE 1967 DOT HAS REQUIRED INSTALLATION OF LAP/SHOULDER BELTS AT THE DRIVER AND RIGHT-FRONT PASSENGER POSITIONS, DESPITE INITIAL OPPOSITION FROM THE DOMESTIC AUTO MANUFACTURERS. THE GREAT MAJORITY OF AMERICANS DO NOT USE SEAT BELTS; THE OVERALL RATE OF USE, WHICH HAS NEVER SIGNIFICANTLY EXCEEDED 20%, IS NOW DECREASING. THE GROUPS THAT SUFFERED THE GREATEST DEATH AND INJURY RATE ARE ALSO THE LEAST LIKELY TO "BUCKLE UP." AFTER EXAMINING EVERY METHOD TO ENCOURAGE BELT USE, AFTER CONDUCTING STUDIES TO DETERMINE BELT EFFECTIVENESS AND MONITOR THE LEVEL OF USE, AND AFTER STUDYING PATTERNS OF BELT USE IN FOREIGN COUNTRIES, DOT HAS DETERMINED THAT THERE ARE THREE POSSIBLE ACTIONS THAT CAN BE TAKEN: MASS MEDIA AND EDUCATIONAL PROGRAMS, HARDWARE OPTIONS (RELATING TO COMFORT AND CONVENIENCE AS WELL AS USE-RE-MINDING DEVICES), AND BELT-USE LAWS; A COMBINATION OF THESE THREE APPROACHES SHOULD BE PURSUED. MASS MEDIA AND EDUCATIONAL PROGRAMS DIRECTED AT A GENERAL AUDIENCE HAVE NOT SUBSTANTIALLY INCREASED SAFETYBELT USE; DIRECTING EFFORTS TO SPECIFIC GROUPS (E.G. CHILDREN AND DRIVER EDUCATION STUDENTS) MAY AFFECT BELT USE MORE. EDUCATIONAL PROGRAMS WILL, HOWEVER, RESULT IN A MORE INFORMED PUBLIC. RESEARCH HAS BEEN CONDUCTED TO DEVELOP BELTS THAT ARE COMFORTABLE, CONVENIENT, AND RELIABLE; THESE RESULTS HAVE

BEEN DISSEMINATED IN THE AUTO INDUSTRY. DOT HAS CONTINUED ITS RESEARCH INTO USE-RE-MINDING SYSTEMS, AS AN ALTERNATIVE TO AN IGNITION INTERLOCK AND TO THE CURRENT FOUR-TO-EIGHT-SECOND LIGHT AND BUZZER WARNING DEVICES. ONE SUCH IS A SEQUENTIAL WARNING WHICH SOUNDS ONLY IF THE OCCUPANT FAILS TO FOLLOW THE PROPER BUCKLING-UP SEQUENCE. THE PRIMARY ALTERNATIVE TO THESE VOLUNTARY APPROACHES IS PASSAGE AND ENFORCEMENT OF STATE BELT-USE LAWS. THERE IS MUCH OPPOSITION IN THE U.S. TO BELT-USE LAWS; IN 1976 A SURVEY FOUND THAT 60% WERE OPPOSED. NONE OF THE 50 BILLS INTRODUCED IN 27 STATE LEGISLATURES BECAME LAW. CONGRESS HAS ALSO BEEN OPPOSED TO REGULATIONS INTENDED TO MAKE DRIVERS USE SAFETY DEVICES. UNLESS THERE IS SOME CHANGE IN ATTITUDE, EFFORTS TO ENCOURAGE BELT-USE LAWS ARE UNLIKELY TO SUCCEED, EXCEPT FOR SPECIFIC GROUPS SUCH AS CHILDREN. THE FEDERAL GOVERNMENT CAN BEST ENCOURAGE ENACTMENT OF LAWS SIMILAR TO THE RECENT TENNESSEE CHILD PASSENGER PROTECTION ACT BY SUPPLYING TECHNICAL AND INFORMATIONAL SUPPORT AND MODEL LEGISLATION.

by JOAN CLAYBROOK  
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